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BEFORE A

SUBCOMMITTEE ON AGRICULTURE, RURAL DEVELOPMENT, FOOD AND
DRUG ADMINISTRATION, AND RELATED AGENCIES

JAMIE L. WHITTEN, Mississippi
MARCY KAPTUR, Ohio
RAY THORNTON, Arkansas
ROSA L. DeLAURO, Connecticut
DOUGLAS "PETE" PETERSON, Florida
ED PASTOR, Arizona
NEAL SMITH, Iowa

JOE SKEEN, New Mexico
JOHN T. MYERS, Indiana
BARBARA F. VUCANOVICH, Nevada
JAMES T. WALSH, New York

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Extension Service	621
National Agricultural Library	777



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AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELATED AGENCIES APPROPRIATIONS FOR 1995

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS HOUSE OF REPRESENTATIVES ONE HUNDRED THIRD CONGRESS SECOND SESSION

SUBCOMMITTEE ON AGRICULTURE, RURAL DEVELOPMENT, FOOD AND
DRUG ADMINISTRATION, AND RELATED AGENCIES

RICHARD J. DURBIN, Illinois *Chairman*

JAMIE L. WHITTEN, Mississippi

MARCY KAPTUR, Ohio

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JAMES T. WALSH, New York

ROBERT B. FOSTER, TIMOTHY K. SANDERS, and CAROL MURPHY, *Staff Assistants*

PART 2

AGRICULTURAL PROGRAMS

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AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELAT- ED AGENCIES APPROPRIATIONS FOR 1995

WEDNESDAY, MARCH 2, 1994.

AGRICULTURAL RESEARCH SERVICE

WITNESSES

**R. DEAN PLOWMAN, ACTING ASSISTANT SECRETARY, SCIENCE AND
EDUCATION, DEPARTMENT OF AGRICULTURE**

**ESSEX E. FINNEY, ACTING ADMINISTRATOR, AGRICULTURAL RE-
SEARCH SERVICE**

ROBERT R. OLTJEN, ACTING ASSOCIATE ADMINISTRATOR (ARS)

JOSEPH S. GARBARINO, BUDGET OFFICER (ARS)

**STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRI-
CULTURE**

OPENING REMARKS

Mr. DURBIN. Good morning, and welcome to this meeting of the House Appropriations Subcommittee on Agriculture, Rural Development, Food and Drug Administration and Related Agencies.

We are happy to have the Agricultural Research Service this morning, some friendly and some familiar faces, and some new ones, too.

At this point in the record we would like to have a biographical sketch from any one appearing before the Committee for the first time.

[The biographical sketch follows:]

BIOGRAPHICAL STATEMENT OF ROBERT R. OLTJEN

Dr. Robert R. Oltjen is currently serving as the Acting Associate Administrator of the USDA's Agricultural Research Service (ARS). Prior to this, he served as Associate Deputy Administrator for Animal Sciences. He received his B.S. and M.S. degrees in Agriculture from Kansas State University and his Ph.D. in Animal Nutrition and Physiology from Oklahoma State University. He joined ARS in 1962 and conducted beef cattle nutrition research at Beltsville, Maryland, until 1977. He served as Director of ARS' Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska, from 1977-1988. In June 1988, he returned to Beltsville to serve as ARS' Associate Deputy Administrator for Animal and Postharvest Sciences. Dr. Oltjen is the author or coauthor of 200 scientific publications. He has received several national awards and a Presidential citation for his research accomplishments. He served as President of the American Society of Animal Science and Chairman of the National Academy of Sciences/National Research Council Committee on Animal Nutrition.

Mr. DURBIN. We have the Acting Assistant Secretary, Dean Plowman; Essex Finney, the Acting Administrator; Robert Oltjen, the Acting Associate Administrator; Ed Knipling, who is the Dep-

uty Administrator for the National Program Staff; Joe Garbarino, Budget Officer; and Steve Dewhurst, our trustworthy and constant companion. [Laughter.]

Dr. Plowman, thanks for joining us this morning and we look forward to your testimony and appreciate the samples that you've brought around.

If you would like to go ahead and make your opening statement, we would be happy to have it.

OPENING STATEMENT OF ACTING ASSISTANT SECRETARY

Dr. PLOWMAN. Thank you very much, Mr. Chairman, and Mr. Skeen. It's always a pleasure to come and talk about our research program.

I will make just a very few brief comments, and we have, as you mentioned, other witnesses, and it sounds like we're all actors, but I can assure you that an acting position doesn't mean that they are not very competent to respond to the issues of agricultural research.

I would like to begin by telling you a bit about our total budget this year. We're asking for about \$1.6 billion that would cover the four agencies of Science and Education, including ARS and CSRS, the Extension Service and the National Agricultural Library, but for this session immediately, we will be focusing in on the Agricultural Research Service.

BUDGET CONSTRAINTS

In looking at our request this year, I'm sure you can appreciate, we can identify many more issues that would serve society well, but we also recognize that with the budget constraints as they are, we can't ask for everything. We can't do everything that would be a good idea to do, and so with that thought in mind, we've taken a very hard look at our research program to see where we could refocus things to higher priority areas. We are proposing some small increases, as well as to redirect our projects again to focus on issues of extreme importance.

REORGANIZATION

With that, I would also indicate to you that an issue that we have been very much involved with is the Department's reorganization. As you well know, Mr. Espy, our Secretary has a reorganization plan that includes some changes in Science and Education. He has provided for a consolidation of these four agencies into one.

We are convinced that implementation of this plan would offer some benefits of a single program planning and management structure, and would enhance our coordination and bring about associated savings, so we look forward to that issue being resolved.

HIGH PRIORITY RESEARCH

I mentioned that we need to refocus on some things, and I could name a few of those things that you have been reading about in the paper. You are very much aware of those very important issues such as food safety, the microbial food safety issues; interest in al-

ternative means of pest control; new quarantine and soil treatments to replace methyl bromide; and utilization of waste.

METHYL BROMIDE

We could go on and on with some very important issues. Let me just give you an example, a rather immediate need to enhance the research that we're doing, and I will use methyl bromide as a case in point.

As you well know, the EPA has listed methyl bromide as a Class I ozone depleter, and under the requirements of the Clean Air Act, by the year 2000, which is just six years away, the domestic production and use of methyl bromide for soil treatment and for quarantine treatments will be banned, and so that's scary for us in agriculture.

There are many crops that absolutely depend on methyl bromide. If we don't have methyl bromide as a soil fumigant, we'll not raise strawberries in some areas of the country. Tomato production will be severely depleted.

And so it's frightening to think that we won't have this tool to use.

In post-harvest, we use methyl bromide as a post-harvest treatment because it's demanded by many countries that import our products, and so we use it to guarantee that the products we send them do not contain disease organisms and insects.

So in thinking about that, we need to do a crash course in developing alternatives for methyl bromide. That's one of our big increase items, and Dr. Finney will provide additional details on that.

LABORATORY CLOSURES

We're also going to talk about streamlining and restructuring our federal laboratory system. After much time and study and consideration, we've identified 19 laboratory locations and two programs that we propose to close.

Closure of these locations will permit us to redirect about \$18.7 million into these higher priority areas that we've talked about. It will also avoid costly maintenance and improvement costs that we would have to incur in most of these locations.

So I want to emphasize that this will have a negative impact on a considerable number of employees, but we're planning to accommodate all of those impacted employees to the extent that we possibly can with other job offers.

So with those very brief remarks, Mr. Chairman, Dr. Finney and his staff here will be prepared to answer and respond to any specific questions that you might have.

[CLERK'S NOTE.—The Acting Assistant Secretary's and Acting Administrator's statements appear on pages 131 through 157. The Explanatory Notes appear on pages 158 through 237.]

REDUCTION IN FTE'S

Mr. DURBIN. Let me thank you for your summary of the issues that are facing your agency, and ask you a few specifics.

We are concerned about the reduction in the number of FTEs. The Department of Agriculture over the next several years has pledged to reduce some 7,500 positions, and we are of course, going to be a part of that process.

One of the areas of concern to the Subcommittee is contractual employees, those people who may not show up in your FTE count, but in fact are employed by the Department of Agriculture for various reasons.

I would like to also add those into this inventory when we talk about reductions, so I need a starting point.

Dr. PLOWMAN. All right.

CONTRACTUAL EMPLOYEES

Mr. DURBIN. Can you give me an idea today of what ARS has in terms of contractual employees—those people who do work for the Department, but aren't counted in the official FTE total.

Dr. PLOWMAN. I'm not sure we are prepared to do that. Are we prepared to do that?

Dr. FINNEY. Yes.

Dr. PLOWMAN. Oh, there is always somebody prepared with an answer. Art?

Dr. FINNEY. Dr. Art Nies is our Associate Deputy Administrator for Management.

Mr. DURBIN. Yes, sir.

SERVICE CONTRACTS

Dr. NIES. Good morning. ARS has a history of relying upon many sources to get the services we need. Under service contracts which are what we rely on for commercial kinds of activities, we currently have 325 FTEs involved.

We have at Tufts University.

Mr. SKEEN. Just a moment. Let me interrupt you. Would you mind coming down and taking one of the mikes? I think the recorder is having a terrible time.

Mr. DURBIN. If you wouldn't mind starting over, sir.

Mr. NIES. Ready?

Mr. DURBIN. Thank you. If you would introduce yourself, please.

Dr. FINNEY. Give your name and title.

Dr. NIES. My name is Arthur H. Nies, I'm the Associate Deputy Administrator for Administrative Management of the Agricultural Research Service.

We have service contracts throughout the country upon which we rely for commercial type activities, and these total approximately 325 FTEs throughout the country. We also have the Tufts University, which is a government-owned, contractor-operated facility, represents 178 FTEs.

Throughout the country in cooperation with the universities in the land-grant system, we have cooperative programs, and under the research support agreements, we have 1,273 FTEs.

We use these interchangeably, depending upon which is the best mix to get the people we need.

CONTRACTUAL EMPLOYEES

Mr. DURBIN. Can you tell me in terms of cost to the Federal Government, whether these contractual employees are more expensive, as expensive, or less expensive than FTEs in your regular service?

A-76

Dr. NIES. Under A-76, you are required to undergo a cost comparison where you compare the cost of doing it in-house and the cost of the contractor doing it.

If it is less costly to use a contractor, then you go to the contractors. That's the A-76. Under the government-owned, contractor-operating facility, I would say it is approximately just about the same at Tufts University. It's just about the same.

Mr. DURBIN. Excuse me, I didn't catch the number at Tufts. You said—

Dr. NIES. It's 178.

Mr. DURBIN. Okay, so you have 325 FTEs in the first category.

Dr. NIES. Right.

Mr. DURBIN. What was, if you will say it again please, the first category?

Dr. NIES. Service contracts.

Mr. DURBIN. Service contracts.

Dr. NIES. A-76.

Mr. DURBIN. There are 178 FTE's at Tufts and approximately 1,273 FTEs under research agreements.

RESEARCH SUPPORT AGREEMENTS

Dr. NIES. Under the research support agreements, it will vary, depending upon the university salary scale throughout the country, but it is roughly equivalent.

Mr. DURBIN. Let me ask you this. If you count at ARS, the number we're given is 7,762 staff years as your current count, then we're talking about, under the contractual arrangement, another 1,700 or 1,800 FTEs.

Dr. NIES. That's correct.

Mr. DURBIN. So that would represent what? I'm talking about percentage.

Dr. FINNEY. It's 20 percent, about 20 percent.

Mr. DURBIN. So 20 percent.

Dr. FINNEY. Roughly.

Mr. DURBIN. Roughly 20 percent. When we get into this mechanism of reducing the 7,762 FTE's, what is to prevent ARS or any other agency from moving those same positions into service contracts?

Dr. NIES. Dollars, dollars.

Mr. DURBIN. Just money.

Dr. NIES. Money. This is the issue.

Mr. DURBIN. I'm sure it's an important issue, but we are also playing at a level where we are counting heads.

Dr. NIES. Right.

FTE'S VS. CONTRACTUAL EMPLOYEES

Mr. DURBIN. And so there is no prohibition or discouragement at this point from moving regular FTE to a service contract employee.

Dr. NIES. There are many impediments under the civil service laws and regulations. You can only use certain employees in a certain capacity. If there is a direct supervisory relationship, you cannot use the contract employee.

You have to be able to describe a service that they can provide independently.

Other than that, I know of no impediment. Of course, you have to work with the unions wherever they're located, and so forth.

FTE REDUCTION GOALS

Mr. DURBIN. What is your goal in FTE reduction over the next several years as part of this reduction to 7,500 in USDA?

Dr. FINNEY. For 1993, our FTE ceiling for the Agricultural Research Service was 8,095, full-time equivalent. For 1994, the ceiling is 8,050 FTEs, and for 1995 which is the year we're discussing in the budget, it's 7,900 FTEs.

CHANGE IN NUMBER OF CONTRACT EMPLOYEES

Mr. DURBIN. And what would be the change in the number of service contract employees or other contractual employees during that same period?

Dr. FINNEY. We have not projected that change.

Mr. DURBIN. Are you being asked to reduce those as well?

Dr. FINNEY. We're not asked to reduce those. That is an open issue, so we have some flexibility in that regard.

CUTTING FTE'S

Mr. DURBIN. Am I on the wrong track here? Is there any reason why we would be cutting the number of FTEs at the Agency, and not also looking at contractual employees?

Dr. FINNEY. One of the things that the Agency would be concerned about is carrying out the programs of the Agency, and if on occasion we don't have the flexibility to do that in-house, and the opportunities arise to carry out the program by supplementing it, and that's consistent with the policies of the Federal Government, then we would accomplish it that way.

Mr. DURBIN. I understand that, but I imagine there are those who would argue that the mission of the Agency is also being threatened by the reduction in FTEs.

Dr. FINNEY. Perhaps.

Mr. DURBIN. Okay. Well, we will look at that together.

Dr. FINNEY. Thank you.

LAB CLOSURE CRITERIA

Mr. DURBIN. As we proceed; we're going to have our hands full with these lab closings. Yesterday in public testimony, we heard from one Member of Congress about his concern related to closure of an ARS facility.

Let me say at the outset what I said yesterday. This is serious. We're not talking about a base closing, but for some Members, it

might as well be a base closing. It's an important facility in their district involving important people, their constituents.

I will speak for myself only, but I suggest that I may reflect what the Subcommittee feels. I'm prepared to stand with the Department on this decision. I don't believe you can have real deficit reduction unless you start talking about this sort of thing.

But if I'm going to support the Department's decision, I have to know that it has been made on the basis of some objective criteria that are defensible.

What kind of matrix, what kind of criteria have you used to choose these 19 facilities?

EVALUATION OF FACILITIES AND LOCATIONS

Dr. FINNEY. Mr. Chairman, the Agricultural Research Service has a process by which it looks at all research programs nationwide.

The issue of our facilities and our locations is one criteria that we have given a great deal of concern, discussion, and evaluation. The types of criteria that we look at in making these types of decisions would be the following:

PHYSICAL CONDITION OF FACILITIES

First of all, we would look at the physical condition of our facilities in terms of whether or not they are at a stage where they would need a substantial investment in order to continue to do that research in those facilities, so we're talking about the physical condition of our facilities.

RELATIONSHIPS BETWEEN LOCATIONS

We look at our locations in terms of the work going on at one location and its relationship with other locations. That is, we will have programs within the Agency where there will be comparable work on a particular commodity at a number of locations.

Mr. DURBIN. Redundancy?

GEOGRAPHICAL LOCATIONS

Dr. FINNEY. Well, it wouldn't be redundancy. There are different geographical areas of the country where the soils and growing conditions would be different, but there may be an opportunity for one facility close to that region to try to pick up and compensate for the work done at a close by location.

So in terms of our national program, how many locations we have doing comparable work is another factor that we looked at.

CRITICAL MASS OF SCIENTISTS

A third factor, of course, would be the critical mass of scientists that we have at a location, so it deals with the size, whether or not we have a location where we have interaction with a number of scientists in different disciplines, or there are only one or two scientists who are really working alone, so we evaluate the size, the critical mass, the instrumentation and facility that can support that research program.

RESEARCH PROGRAM

Whether or not that particular location plays a unique role in our national system—for example, our tropical research programs where we need to preserve our germplasm, that would be a unique facility that we may not have elsewhere, so we would look at that type of issue.

ROLE OF FEDERAL RESEARCH

The other criteria we would look at, of course, is what we are doing within the Federal laboratories that might be complementary or related to programs in the universities, the state system, as well as the private sector system.

We are looking at our role compared to the roles of other actors and components within the overall agricultural research enterprise.

MATURITY OF TECHNOLOGY

The other factor we looked at, of course, would be the maturity of the technology that's being developed. For example, in a location we may have been developing new varieties or releases of a particular crop. We may have made a number of releases over the years. We may have reached the conclusion that there is an adequate amount of varieties to sustain that crop for a period of time.

It doesn't mean that it solves the problem indefinitely, but that's a factor.

So those are the types of things that we look at in terms of making these decisions on which locations should be closed when that decision has to be made.

COST OF CLOSING FACILITY

Mr. DURBIN. I didn't hear you talk about the cost of closing a facility.

Dr. FINNEY. Well of course, that would be related to the cost of operation and maintenance, the physical conditions of the facility, and the operating costs, so that was also a factor that we looked at.

COST OF TRANSFERRING EMPLOYEES

Mr. DURBIN. Transferring employees, how much money is involved in that, as opposed to keeping a facility open is taken into consideration.

Dr. FINNEY. That's taken into consideration.

COST ANALYSIS

Mr. DURBIN. Now, will you be sharing with us your analysis of each of these centers and reasons for choosing them over others?

Dr. FINNEY. We can prepare that and get them to you.

Mr. DURBIN. I think you're going to have to because we're going to be asked these questions again and again.

Dr. FINNEY. I'm sure that's true, yes.

Mr. DURBIN. So I hope you will share that with us.

[The information follows:]

The projects and resources associated with location closures have been carefully reviewed and evaluated in a national context. Several criteria were applied:

- o Physical condition of facilities.
- o Relationship to similar programs at other locations.
- o Critical mass of scientific staff/interactions.
- o Essential or unique role in National programs.
- o Relationship to State & private sector capabilities.
- o Maturity of the technology; base of knowledge available.
- o Essential role in support of Action Agencies of Department.

The following locations are proposed for closures in FY 1995:

Fairbanks, Alaska -- Soils Research (\$729,500, 9 personnel)

The primary thrust of the program has been the development of a grain cropping system for Alaska. That task was successfully completed, but market conditions have prevented the development of a significant grain farming enterprise. More recently, research has shifted to the measurement of greenhouse gases and work on frozen soils. There is not a suitable representation of scientific disciplines at the location to operate a productive program in greenhouse gases. Frozen soil work is carried on in Minnesota and Washington research locations.

Brawley, California -- Natural Resources and Crop Production (\$306,000, 6 personnel)

Brawley serves primarily as a staging area for field work in soil and water management, entomology, and crop production directed from other ARS laboratories such as Riverside, Fresno, and Salinas, California; and Phoenix, Arizona. The facilities duplicate those in the Imperial Valley of the University of California, and much of the work is directed at unique problems in one section of California. The research is of relatively lower priority given other ARS priorities and existing fiscal constraints. To the extent desirable, field work can be continued in the Valley from remote locations without maintaining the local facilities.

Pasadena, California -- Research on Citrus and Subtropical Crops (\$450,000, 20 personnel)

The mission of the Fruit and Vegetable Chemistry Laboratory in Pasadena is to conduct research on the chemistry, biochemistry and physiology of subtropical and citrus crops and products with primary emphasis on quality control and enhancement. Increased operating costs resulting from inflation and pay act increases have reduced discretionary funding levels for scientists to highly unacceptable levels and decreases in staffing and retirements have jeopardized adequacy of disciplinary diversity and critical mass. Further, the facility does not meet modern health and safety standards nor the California earthquake

codes. Repairs are estimated at several million dollars. The major portion of the citrus quality research can be continued at the Agency's Western Regional Research Center, Albany, California where facilities are already being upgraded and a wide range of scientific disciplines are represented. Other resources can be most effectively utilized at Fresno, California, for research on alternatives to methyl bromide, and at Salinas, California, for vegetable production systems research.

Balance of funds (\$1,070,400) will be redirected to Fresno, CA (\$459,700); Salinas, CA (\$115,300); and Albany, CA (\$495,400).

Georgetown, Delaware -- Poultry Research (\$756,200, 10 personnel)

The mission of the Poultry Research Laboratory in Georgetown is to improve the lean-to-fat ratio of meat-type poultry. The program focuses on biochemical, genetic, nutritional, and physiological mechanisms concerned in the developmental control of fat and protein deposition. The poultry industry has indicated their priorities and the highest priorities are already being dealt with at other ARS locations. Poultry research is carried out at Athens, GA; East Lansing, MI; Mississippi State, MS and Fayetteville, AR and can be adapted to the research carried out at Georgetown, Delaware.

Miami, Florida -- Research to Eliminate Quarantine Barriers (\$331,000, 34 personnel)

The Subtropical Horticultural Research Laboratory in Miami has two distinct programs -- acquisition, maintenance, and distribution of subtropical and tropical germplasm of agricultural importance, and development of technologies to maintain quality and eliminate quarantine barriers for subtropical and tropical fruits and vegetables. Postharvest research has been severely limited due to loss of tropical and subtropical fruit orchards in Hurricane Andrew. Reestablishment of fruit production in this area in the long-term is questionable. Facility disruption by the hurricane and unrelenting urban encroachment dictate consolidation of these activities at other relevant Agency locations. Transfer of the germplasm to Agency facilities at Mayaguez, Puerto Rico and Hilo, Hawaii, will consolidate appropriate conservation programs, increase management efficiency and eliminate possibility of frost damage to temperature sensitive materials. Similarly, consolidation of the postharvest programs at Orlando and Gainesville, Florida, will increase the opportunity for the Agency to achieve the disciplinary diversity and critical mass needed to develop alternatives to the postharvest fumigation use of methyl bromide and improved shelf life of U.S. exports. Transferring these programs to other ARS locations will avoid major reconstruction cost at Miami.

Balance of funds (\$1,421,100) will be redirected to Mayaguez, PR (\$433,100); Orlando, FL (\$505,000); and Gainesville, FL (\$483,000).

Savannah, Georgia -- Stored Product Insects Research (\$450,000, 42 personnel)

The mission of the Stored Product Insects Research and Development Laboratory in Savannah is to develop the means to prevent or reduce insect damage and contamination of agricultural commodities and their products in on-farm storage and in marketing channels. Though the laboratory is adequately funded to conduct its planned research, facilities at Savannah are old, inappropriate for today's research, and in need of costly repairs and modernization. The estimated cost of just bringing them up to modern, safe standards is more than \$3 million. Further, the Agency has underutilized facilities at the U.S. Grain Marketing Research Laboratory, Manhattan, Kansas, and the Insect Attractants, Behavior and Basic Biology Laboratory, Gainesville, Florida. Redirection of the major portion of the resources to these locations would enhance the disciplinary diversity and critical mass at each. Other portions of the resources would be used to strengthen high priority programs on alternatives to methyl bromide and grain quality issues important to export.

Balance of funds (\$2,370,000) will be redirected to Fresno, CA (\$344,200); Manhattan, KS (\$1,565,300); Gainesville, FL (\$387,200); and Headquarters (\$73,300).

Hilo, Hawaii -- Nutrient Requirements of Shrimp and Shell Fish (\$1,477,900)

The mission of the ARS research unit in Hilo is to define the nutrient requirements of shrimp and finfish. Research accomplishments derived from the Oceanic Institute grant since its inception have been demonstration-type reports, with marginal discovery and few peer-reviewed articles. In this regard the ARS program is of lower priority and is proposed for termination.

Lexington, Kentucky -- Tobacco Research (\$1,226,900, 15 personnel)

Current funds at Lexington are divided between an inhouse research project on use of the tobacco plant to study carbon and nitrogen metabolism and a cooperative project with the University of Kentucky. Funds provided to the University of Kentucky are used to support a variety of research projects including breeding of improved tobacco varieties, pest resistance, cultural methods, and chemical composition of the tobacco plant. Most of the original research objectives have now been accomplished and there are other production and marketing problems with other important economic crops that have a higher national priority. Much of the research now being conducted by the University of Kentucky with Federal funds is directed toward solving tobacco production problems of the State, and as such, should be funded with State funds or through Hatch Act formula funds.

Lexington, Kentucky -- Forage Research (\$321,600)

A small program in forages at Lexington would be eliminated. The forage program is narrowly focused on local problems and can be eliminated.

Houma, Louisiana -- Sugarcane Research (\$1,382,900, 35 personnel)

Research in Houma is exclusively on the breeding and culture of sugarcane. Emphasis is on the development of new improved varieties, the use of genetic engineering procedures to introduce new genes or genetic material into existing varieties, control of weed populations, and improved methods of insect and disease control. This research has been very successful and the yield of sugar/acre has increased over the years through use of ARS varieties. Over the last 13 years, ARS has released 30 new varieties, some of which have been jointly released with Louisiana State University. Inasmuch as all the research now conducted at this ARS location is exclusively to benefit the Louisiana sugarcane industry, it is appropriate that the State assume a larger role in providing for the research needs of the industry.

Beltsville, Maryland -- Tobacco Research (\$397,600, 4 personnel)

Tobacco research at Beltsville involves using the plant as a model plant system for research on regulation and expression of genes involved in accumulation of seed oil and protein in economic crops and for development of improved tissue culture technologies. This research has been useful but can now be terminated. Major advances have been made in genetic engineering and tissue culture technologies during the last few years and there are now other plants such as soybean, wheat, rice, and corn that can be used as crop model systems. It is more appropriate to use these other crops for basic research studies as new genetic materials derived from the research programs can be used directly to enhance yield, composition, nutritional quality, and other important plant characteristics.

Beltsville, Maryland -- Livestock Insects Research (\$1,289,400, 10 personnel)

The mission of the Livestock Insects Laboratory in Beltsville is to discover new knowledge for controlling insects to improve agricultural efficiency, and protect human and animal populations. Various methods are being developed to reduce the destructive effects of flies, mites, ticks, etc., on farm livestock and people. The major researchable problems that justified forming the laboratory have for the most part been solved. In addition, a portion of the current effort is duplicated elsewhere in ARS. These factors, plus old facilities necessitate the reduction of this effort.

East Grand Forks, Minnesota -- Potato Research (\$960,300, 9 personnel)

The Potato Research Laboratory at East Grand Forks is a partner in a Federal-State-private industry collaboration to improve quality and reduce postharvest losses for the farmer, handler and processor. The laboratory has successfully resolved postharvest handling and storage issues by defining the relevant variables and developing an expert system to guide producers and processors in storage loss prevention. Current research emphasis is on variety evaluation for end use quality, and identification of biorational means for controlling sprouting. The latter research is also addressed at the Agency's Northern Crop Science Laboratory in Fargo, North Dakota, where there is the critical mass of scientific disciplines lacking at the East Grand Forks location.

Sidney, Montana -- Sustainable Farming Systems (\$741,600, 15 personnel)

The mission of the location is to develop sustainable farming systems for the Northern Great Plains, including dryland and irrigated crop production. As a satellite from Bozeman, the unit is actively working on biocontrol of leafy spurge and other range weeds. The laboratory has made significant contributions to water conservation, erosion control, and crop production over the years. However, the Sidney Laboratory is a relatively small location and similar work is carried on at Bozeman, Montana; Mandan, North Dakota; Cheyenne, Wyoming; and Akron, Colorado. The Agency can serve the needs of the Northern Plains effectively from these remaining four locations.

Oxford, North Carolina -- Tobacco Research (\$1,766,800, 28 personnel)

Tobacco funds at Oxford are used for a variety of research projects including breeding of improved tobacco varieties, molecular and biochemical control of nitrogen assimilation in tobacco and other plants, and control of insect and disease pests. Many of the original research objectives have been accomplished, production problems of the tobacco industry are now much less acute than they were previously, and the tobacco growers are diversifying their operations to other crops. Much of the research now being conducted by ARS scientists relate to local tobacco production problems which can be considered as the responsibility of individual States.

Chatsworth, New Jersey -- Blueberries and Cranberries (\$514,400, 4 personnel)

Research at Chatsworth is on breeding of blueberries, and on improved methods of disease control in blueberries and cranberries. Excellent progress has been made and both the cranberry and blueberry industries are thriving and expanding. To a large degree, the original objective of this research has been accomplished. ARS has introduced 51 new improved varieties of high bush blueberries over the last 50 years and these are mainly tolerant of major disease problems. Largely through ARS research, disease problems of cranberries are

now greatly reduced. Since the cranberry and blueberry industries are thriving and these crops are major agricultural industries in the State of New Jersey, it is appropriate for the industries themselves and the State to continue whatever research may be required in the future. Some blueberry breeding will continue at Beltsville, Maryland, and the National Blueberry Repository will continue to be maintained at Corvallis, Oregon.

Delaware, Ohio -- Seedling Trees and Dutch Elm Disease (\$263,400, 7 personnel)

Current research is on the development of more accurate ways to screen seedling trees for resistance to disease pests, potential use of biological methods of control of the Dutch elm disease, and improved methods of propagation of improved elm tree varieties. This research is largely devoted to research on the American elm. ARS has released seven new improved elm varieties with resistance to the Dutch elm disease and nurserymen are successful in propagating these new varieties. Furthermore, scientists at the National Arboretum, Washington, D.C., have a very active tree breeding program and can continue to evaluate existing elm selections for introduction to the nursery industry if there is a need to do so. The attempt to find a biological means of control for the Dutch elm disease has not been successful and is not considered to be feasible at this time.

El Reno, Oklahoma -- Soil/Forage/Animal Systems (\$1,666,900, 23 personnel)

The mission of the Grazinglands Research Facility at El Reno is to increase the efficient production of lean red meat from forages by increasing the quantity and quality of forages. A soil/forage/animal systems research approach to meat production is the main research emphasis at El Reno. Facilities are old and badly in need of upgrading/modernization, especially the feedlots, fences, other infrastructure, etc. Similar research is being conducted by ARS at Clay Center, Nebraska and Miles City, Montana. The research programs at these locations are better focused, more productive and can meet the research needs of clients located in different ecological production areas of the United States. Further, suitable facilities are available to conduct the research at these locations.

Jackson, Tennessee -- Soybean Research (\$166,900, 2 personnel)

Current research objectives at Jackson are to develop enhanced soybean germplasm with resistance to the cyst nematode and to study the influence of resistant germplasm on the development of new pathogenic races of the nematode. It is more appropriate to conduct the research at Stoneville, Mississippi, as an objective of an existing research program on breeding improved soybean varieties. Consolidation of the research at Stoneville would help strengthen the existing ARS-Mississippi cooperative program at Stoneville where there is a large number of scientists and the opportunity for interdisciplinary research.

Lewisburg, Tennessee -- Dairy Research (\$143,900, 1 person)

The mission of the Dairy Production and Genetics Research Unit in Lewisburg is to conduct research related to problems in the operation of dairy farmers in the upper South. Areas of research include nutrition, genetics, management, physiology of reproduction, and management of waste materials. Current funding is inadequate to support one scientist. In addition, only Jersey cows are available for research while the U.S. dairy herd is 90+ percent Holstein. Scientific productivity has been poor and the facilities are old and badly outdated.

Brownwood, Texas -- Pecan Research (\$473,100, 12 personnel)

The objective of the research at Brownwood is to evaluate pecan germplasm and introduce improved varieties. In recent years, most of the new experimental plantings have been cooperatively established with Texas A&M University at College Station. This research has been very productive and ARS has introduced 18 new improved varieties which are now widely grown throughout the pecan belt. In view of the need to address other agricultural problems of high national priority, there is now a need to terminate this research. The new ARS varieties are widely grown and there is reduced need for this research. With the availability of existing improved varieties and the lack of expansion of plantings of improved varieties in the U.S., the future need for additional improved varieties is not considered of high national priority. The collection of unique pecan germplasm now located at Brownwood will continue to be maintained.

Suffolk, Virginia -- Peanut Research (\$666,700, 8 personnel)

The mission at Suffolk is to develop peanut germplasm and cultivars with desirable agronomic and end use characteristics, to devise effective control strategies for foliar diseases, and develop optimum peanut and corn production systems. Research emphasis is on virginia-type peanuts grown almost exclusively in Virginia and North Carolina as part of a Federal-State collaborative peanut research effort in these States. Though virginia-type peanuts command a strong position in the European market, domestic markets for snack nut products have plateaued and southeastern runner-type peanuts are preferred for peanut butter products. Both markets are affected by consumer desire to reduce fat intake. Closure of this location would create an opportunity for commercial entry into peanut cultivar development and permit the Agency to concentrate efforts on its postharvest quality program for virginia-type peanuts at Raleigh, North Carolina.

Rotterdam, The Netherlands -- Export Quality Research (\$342,600, 1 person)

The mission of the Rotterdam laboratory is to conduct research that will contribute to more efficient marketing of U.S. agricultural products in Europe. With the maturation of the European market, the mission of this location is essentially accomplished. Thus, if limited agency resources become available, these would best be directed toward issues evolving from the emerging and rapidly expanding market opportunities for U.S. products in the Pacific Rim.

Headquarters and Area Management Reduction (\$1,874,400)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

REORGANIZATION PROPOSAL

Mr. DURBIN. What were your criteria for determining which laboratories would be closed?

Dr. FINNEY. The projects and resources associated with location closures have been carefully reviewed and evaluated in a national context. Several criteria were applied: Physical condition of facilities; relationship to similar programs at other locations; critical mass of scientific staff/interactions; essential or unique role in National programs; relationship to State and private sector capabilities; maturity of the technology; base of knowledge available; and essential role in support of Action Agencies of Department.

Mr. DURBIN. In developing your plan to close laboratories, were any dropped from the list?

Dr. FINNEY. ARS used the above criteria to evaluate every ARS location. Based upon these evaluations, 19 locations were identified for closure. No locations were dropped from this final list.

Mr. DURBIN. Were any laboratories added to the list?

Dr. FINNEY. No locations were added to the list.

Mr. DURBIN. If these 19 laboratories are not closed, how much will be added to your fiscal year 1995 funding requirements?

Dr. FINNEY. The total FY 1994 budget of the programs identified for reduction at these locations is \$18.7 million. This amount would be required for addition to the FY 1995 budget if the 19 laboratories are not closed.

Mr. DURBIN. By what date do you have to close these laboratories in order to stay within your budget plan?

Dr. FINNEY. The Agency has funds appropriated through September 30, 1994, to operate the facilities. The facilities would need to be closed soon thereafter in order to achieve the estimated savings.

Mr. DURBIN. You have a number of laboratories that have 10 or fewer scientists according to material provided to the Committee during last year's hearing. You plan to close only 7 of these small laboratories. Did you review all of these smaller laboratories in developing your proposal?

Dr. FINNEY. Yes, every location was evaluated using specific criteria developed by the Agency. Using these criteria, 19 locations were identified for closure. I would note that size is not necessarily the deciding factor, since many of these smaller locations provide a unique input into a National research program and many benefit from close affiliation with a university that effectively broadens the disciplinary mix.

REORGANIZATION PROPOSAL

Mr. DURBIN. Would you please list for the record all of the ARS laboratories that have fewer than 10 scientists currently located at the facility?

Dr. FINNEY. The following table reflects locations with less than 10 scientists at the facility. Included are Research and Service scientists only. This table excludes Research Associates and Support positions.

Agricultural Research Service
Laboratories With Fewer Than 10 Scientists

<u>Location</u>	<u>Scientists on Board</u>
Alaska:	
Fairbanks	2
Arkansas:	
Booneville	4
Fayetteville	5
Pine Bluff	0
Stuttgart	3
California:	
Brawley	0
Davis	8
Pasadena	9
Salinas	5
Shafter	3
Colorado:	
Akron	6
Delaware:	
Georgetown	1
Newark	3
Florida:	
Brooksville	3
Canal Point	4
Ft. Lauderdale	5
Miami	9
Winter Haven	7
Georgia:	
Byron	8
Dawson	9
Griffin	6
Savannah	9
Watkinsville	8
Idaho:	
Aberdeen	8
Boise	8
Dubois	5
Kentucky:	
Lexington	6
Louisiana:	
Houma	6
Maine:	
Orono	4
Maryland:	
Frederick	8
Hyattsville	4
Massachusetts:	
Boston	1
Minnesota:	
E. Grand Forks	3
Morris	8
Mississippi:	
Poplarville	4
Montana:	
Miles City	8
Sidney	2
New Jersey:	
Chatsworth	2
New Mexico:	
Las Cruces	7

Agricultural Research Service
Laboratories With Fewer Than 10 Scientists (continued)

<u>Location</u>	<u>Scientists on Board</u>
New York:	
Geneva	2
Greenport	7
Nevada:	
Reno	3
North Carolina:	
Oxford	9
Ohio:	
Columbus	2
Coshocton	4
Delaware	2
Wooster	9
Oklahoma:	
Durant	7
El Reno	5
Lane	7
Woodward	5
Oregon:	
Burns	3
Pendleton	7
Puerto Rico:	
Mayaguez	6
South Carolina:	
Clemson	6
Florence	9
South Dakota:	
Brookings	7
Tennessee:	
Jackson	1
Lewisburg	0
McMinnville	0
Texas:	
Beaumont	6
Brownwood	2
Bushland	9
Houston	4
Kerrville	8
Virgin Islands:	
St. Croix	0
Virginia:	
Suffolk	3
Washington:	
Prosser	9
Wenatchee	7
Yakima	8
Wyoming:	
Cheyenne	6
Laramie	5
OTHER COUNTRIES	
Argentina:	
Buenos Aires	0
France:	
Montpellier	3
Mexico:	
Tuxtla-Gutierrez	2
Netherlands:	
Rotterdam	1
Total Research and Service Scientists	<u>375</u>

SO-CALLED PORK BARREL RESEARCH

Mr. DURBIN. Let me also move to an area of concern for this agency and our subcommittee.

We have a group of slope-shouldered, thick-foreheaded folks who are opposed to scientific research. They think it's a waste of money. One area of waste these so-called pork-busters found was in human nutrition research. They thought the idea of research on human nutrition was really a laugh.

Would you like to say a few words about human nutrition research and its importance?

HUMAN NUTRITION RESEARCH

Dr. FINNEY. Yes, Mr. Chairman. As you know, in America, we are very well-fed in terms of production of agricultural products. One of the major concerns that the public has and that we have as a research organization is the relationship between what we eat; our health; our ability to avoid disease; and increase the life expectancy of our population.

So it is important not only for the Department of Agriculture, but the Nation as a whole to have reliable information in terms of what the consumption of food is in the United States; the recommendations that we should follow in terms of optimum diets for extending our life; and of course, reducing health care costs. It's not independent of the health care issue that this administration is very much concerned about as well.

HUMAN NUTRITION RESEARCH CENTERS

So that the Department over the years of course, has developed a series of agricultural research centers specifically for human nutrition research. There are five of these major centers, Mr. Chairman. They deal with specific concerns of the public including the nutritional requirements of women, infants and children, the nutritional requirements of aging—and they have certain special problems in terms of their lifelong processes.

We have a particular center dealing with the mineral and nutritional requirements that are required for optimum health, so we are very convinced, Mr. Chairman, that the investment in developing scientific information so that the American population can have reliable dietary recommendations is essential for the well-being of the country as well as in terms of reducing our health care costs.

So we think the department has an essential role, and that investment is an excellent investment on behalf of the public.

SOYBEAN-BASED INK

Mr. DURBIN. I agree with you. The other one is a little closer to my home, and that was the criticism of the so-called pork-busters over research into soybean-based ink. This was requested by the President, and approved by both the House and the Senate.

Could you comment on whether or not this has been an effective endeavor?

Dr. FINNEY. Oh, yes. Mr. Chairman, as you know, the Agricultural Research Service has been, over the years, investing in research to develop new products from raw agricultural materials,

and that's important to the economic well-being of the farmer as well as the industries that depend upon these raw materials.

In the case of soy ink, it also has an additional benefit in that it would be a replacement for petroleum-based products, and that's important in terms of our export markets or exchange internationally, as well as the environmental benefits of the natural products from soybean ink.

So we feel as though that has a number of merits that well-justify the investment that has gone into that project.

SCREWORM PROGRAM

Mr. DURBIN. One of the last projects that this group giggled at was screwworm research. That's another one they thought—they love to pick those words out that they don't understand and giggle about them. Can you tell us a little bit about the \$34 million in the screwworm program?

Dr. FINNEY. I think Dr. Plowman has a special insight, and he would like to respond to that.

Mr. SKEEN. If he needs help, I'll give it to him.

Dr. PLOWMAN. I just signed a letter this morning that I've sent to the Washington Post in response to their pork-buster issue addressing the screwworm directly.

I said in there that how short a memory we have. A number of years ago we had a serious problem. It was costing us in this country about \$400 million a year to treat livestock and wildlife and people because of screwworm infestation.

Now, all those costs get passed on to the consumer. We had some very innovative researchers in ARS that developed the technology to eliminate the screwworm. Last year they received the World Food Prize for research on that issue.

Now, screwworms don't know where the border is. You know, we can clean it up in this country, and we did, but they don't know where the border is, and so it was necessary for us to move that technology into Mexico, and we have done that in conjunction with the Mexican Government, and we have moved it now clear down to the Isthmus of Panama.

The objective is to set up a permanent barrier at that point. With the signing of NAFTA, that's even more important because we're going to have a lot more interchange of livestock back and forth.

So for a \$34 million a year investment—and it is a maintenance control program, it's not a research program at all—we can realize all those benefits. We've estimated that for every dollar the government has spent on screwworms, we have realized a \$10 return.

Now, I'll stack that up against almost anything anybody wants to talk about, so I'm hoping that the Washington Post will print the letter that I've sent to them in rebuttal to the nonsense that they are putting out.

Mr. DURBIN. Thank you. I hope they will, too. I share your feelings. I think sometimes the Citizens Against Government Waste get a little carried away. Their symbol shouldn't be a pig, but should be an empty head sometimes. [Laughter.]

And unfortunately, they have followers in our chamber, the Flat Earth Society Caucus, and we have to fight them all along the way, and we'll need your help to do it.

Let me turn now to some questions on your budget request.

ARS BUDGET REQUEST

Mr. DURBIN. Would you please list for the record your budget request to the Office of the Secretary, the Secretary's request to the Office of Management and Budget, and the OMB allowance? We are interested in learning your research priorities, which may differ from the Secretary's Office or OMB's.

Dr. FINNEY. The ARS budget recommendations as they progressed through the budget process will be provided for the record. [The information follows:]

FISCAL YEAR 1995 APPROPRIATION HISTORY
[In thousands of dollars]

<u>Program Increases</u>	<u>Agency Estimate</u>	<u>Department Estimate</u>	<u>Budget Estimate</u>
Research to Assure			
Food Safety.....	+ \$30,000	+ \$10,000	+ \$10,000
Research to Promote			
Human Health.....	+25,000	+3,500	+3,500
Research on Pesticide			
Reduction in Fruits			
and Vegetables.....	+10,000	+7,500	+7,500
Research to Develop			
Methyl Bromide			
Alternatives.....	+10,000	+5,000	+5,000
Research on Waste			
Utilization.....	+10,000	+1,000	+1,000
Research on			
Agricultural			
Biodiversity.....	+10,000	+1,000	+1,000
Research on			
New Uses.....	+6,000	- -	- -
Research on Biofuels...	+4,000	- -	- -
U.S. - Israel			
Binational			
Agricultural			
Research and			
Development.....	- -	- -	+2,500
Strengthen Scientific			
Excellence in			
Plant Genetics.....	+8,000	- -	- -
Strengthen Scientific			
Excellence in			
Animal Health.....	+5,000	- -	- -
Strengthen Scientific			
Excellence in			
Forages.....	+5,000	- -	- -
Strengthen Scientific			
Excellence in			
Ranges.....	+5,000	- -	- -
Strengthen Scientific			
Excellence in			
Decision Models.....	+2,000	- -	- -
Increased Operating			
Costs.....	+7,082	+7,083	+7,083
Increased Pay			
Costs.....	+5,929	+5,930	+4,139
SES Lump Sum			
Costs.....	+1,347	+1,347	+1,347
<u>Program Decreases</u>			
Reductions in FTE and			
savings from lower			
priority research	- -	-9,000	-18,700
and location closeouts			
Administrative			
Efficiency Savings..	- -	-7,052	-7,052
TOTAL, Program			
Increases.....	<u>+144,358</u>	<u>+26,308</u>	<u>+17,317</u>

FISCAL YEAR 1995 APPROPRIATIONS HISTORY - BUILDINGS AND FACILITIES

	Agency Estimate	Department Estimate	Budget Estimate
National Animal Disease Center, Ames, IA (Construction).....	\$4,100	--	--
BARC, Beltsville, MD (Modernization)....	25,000	\$5,000	\$5,000
ARS Regional Research Centers (Modernization):			
Albany, CA.....	8,900	5,600	5,600
New Orleans, LA.....	6,300	3,200	3,200
Peoria, LA.....	14,000	4,300	4,300
Philadelphia, PA.....	7,500	--	--
Subtotal, Regional Research Centers...	36,700	13,100	13,100
Horticulture Research Laboratory, Ft. Pierce, FL (Planning).....	2,900	--	--
U.S. Horticultural Crop Research and Water Management Research Laboratory, Parlier, CA, (Planning).....	2,900	--	--
European Biological Control Laboratory Montpellier, France (Construction).....	2,600	2,600	2,600
Plum Island Animal Disease Center, Greenport, NY (Modernization).....	10,000	5,000	5,000
USDA Avian Disease Control Laboratory, East Lansing, MI (Design/Construction)..	4,900	--	--
Rearing and Genetics Laboratory, Waimanalo, HI; Tropical Fruit and Vegetable Laboratory, Hilo, HI (Planning).....	2,300	--	--
National Swine Research Center, Ames, IA (Construction).....	11,000	--	--
National Rice Research Center, Stuttgart, AR (Construction).....	9,800	--	--
U.S. Grain Marketing Research Laboratory, Manhattan, KS (Design).....	1,200	--	--
Subtropical Agricultural Research Laboratory, Weslaco, TX (Modernization).	780	--	--
USDA/ARS Plant Stress and Water Conservation Laboratory, Lubbock, TX (Construction).....	11,000	--	--
U.S. National Arboretum, Washington, D.C. (Modernization).....	2,000	--	--
Plant Physiology and Genetics Research Laboratory, Urbana, IL (Design).....	200	--	--
Entomological Laboratory, Gainesville, FL (Modernization/Construction).....	3,500		
ARS Plant and Natural Resources Lab, Maricopa, AZ (Design).....	2,200	--	--
U.S. Vegetable Laboratory Charleston, SC (Design/Construction)....	18,000	--	--
Pollinating Insect Laboratory, Logan, UT (Design).....	400	--	--
Sugarbeet, Bean and Cereal Research Laboratory, East Lansing, MI (Design/Construction).....	750	--	--
North Central Soil Conservation Research Laboratory, Morris, MN (Construction)...	3,200	--	--
TOTAL, Buildings & Facilities	<u>155,430</u>	<u>25,700</u>	<u>25,700</u>

BILL LANGUAGE

Mr. DURBIN. You are requesting bill language to exempt Parlier, California and Grand Forks, North Dakota from the \$100 limit on the purchase of land. The Parlier exemption is already in the fiscal year 1994 bill. Why are you not able to acquire the additional 22 acre grow-out site during fiscal year 1994?

Dr. FINNEY. It is the intent of ARS to complete the acquisition process in fiscal year 1994. However, since ARS just learned that this land may be available for purchase, we have initiated an independent appraisal to determine the property's estimated fair market value, the first step in the land acquisition process. Our request for language to exempt Parlier, California, in fiscal year 1995 is to ensure the acquisition process will continue should we fail to complete negotiation in fiscal year 1994.

Mr. DURBIN. You plan to purchase land for parking facilities for volunteers participating in human nutrition studies at Grand Forks. How much land are you planning to purchase and what is the estimated cost?

Dr. FINNEY. We plan to purchase a 0.177-acre city lot with a house at an estimated fair market value of \$74,000.

Mr. DURBIN. In order to use this land for parking facilities, will it have to be paved and lighted, and if so, what will be the cost.

Dr. FINNEY. ARS plans to pave and light the parking lot to meet the building code of Grand Forks, North Dakota. The estimated cost is \$45,000.

OBJECT CLASS TABLE

Mr. DURBIN. You propose an administrative savings of \$7,052,000 by reducing such areas as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities. You also propose an across-the-board increase in the non-salary accounts. Would you please provide for the record an object class table showing the fiscal year 1994 base, the distribution of the \$7,052,000 reduction, and the 2.6 percent increase? [The information follows:]

AGRICULTURAL RESEARCH SERVICE—CLASSIFICATION BY OBJECTS

[In thousands of dollars]

	Fiscal year 1994 base	Admin. overhead reduction	2.6 percent inflation
Personnel Compensation:			
11.1 Permanent positions	290,653	.....	.....
11.3 Positions other than perm	20,135	.....	.....
11.5 Other personnel comp	8,333	.....	.....
12.1 Personnel benefits	69,144	.....	.....
Total Personnel compensation and benefits	388,265	.....	.....
Other Objects:			
21.0 Travel and Transport. of Persons	11,148	- 317	267
22.0 of Transportation Things	1,095	- 31	26
23.2 Rent Paid to Others	1,339	- 38	32
23.3 Comm., Util., Misc. Chgs	29,946	- 853	718
24.0 Printing and Reproduction	1,414	- 39	34
25.1 Consulting Services	115	.....	.....
25.2 Other Services	57,590	- 1,642	1,380

AGRICULTURAL RESEARCH SERVICE—CLASSIFICATION BY OBJECTS—Continued

[In thousands of dollars]

	Fiscal year 1994 base	Admin. overhead reduction	2.6 percent inflation
25.3 Purchases of Goods and Services	28,931	- 825	693
25.4 Operation of GOCOs	28,704	- 819	688
25.5 Research and Development Contracts	36,088	- 1,030	865
26.0 Supplies and Materials	51,103	- 1,458	1,225
31.0 Equipment	35,011	.....	839
32.0 Land and Structures	3,287	.....	79
41.0 Grants, Subsidies and Contributions	9,865	.....	237
Total, Other Objects	295,636	- 7,052	7,083
Total, Direct Obligations	683,901	- 7,052	7,083

CONSULTANT SERVICES

Mr. DURBIN. In reviewing your object class table on page 8-5 of the notes, you are showing \$115,000 for consultant services in fiscal years 1994 and 1995. For what purpose, specifically, are these funds used?

Dr. FINNEY. These funds are made available for employment under 5 U.S.C. 3109. This authority is utilized by the Agricultural Research Service for the purpose of hiring consultants and advisors for research advisory expertise and does not affect or influence administration or management. However, during fiscal year 1993 no one was hired using this authority.

EQUIPMENT

Mr. DURBIN. Your equipment purchases increase from \$32,892,409 in fiscal year 1993 to an estimated \$37,588,000 in fiscal year 1995. That is an increase of 14.2 percent, which would be considerably in excess of inflation. Why the large increase in this account?

Dr. FINNEY. The large increase reflected for fiscal year 1995 above what was obligated in fiscal year 1993 is due to inflationary costs over the past two years coupled with the budgeted increase for fiscal year 1994 and fiscal year 1995.

The increased cost provides for anticipated increases in the purchase of modern up-to-date equipment which will enhance the efficiency output of ARS and enable the agency to keep up with state-of-the-art.

AFLATOXIN RESEARCH

Mr. DURBIN. Please describe for the Committee the work you have underway on aflatoxin.

Dr. FINNEY. ARS research on aflatoxin is directed toward the prevention and control of aflatoxin in commodities of plant origin, that is peanuts, corn, cottonseed, and tree nuts. Research approaches include conventional breeding to identify natural resistance in crops, and bioengineering to enhance natural resistance where possible, developing naturally occurring non-aflatoxin producing strains of *Aspergillus flavus* and *A. parasiticus* that will displace the toxin producing strains, and manipulating agronomic and

ecological factors and postharvest handling to minimize conditions conducive to aflatoxin formation at all steps from production to the consumer. Other research continues and expands upon initial success in the identification of an aflatoxin regulatory gene from *A. flavus*.

Mr. DURBIN. What are some of the agency's accomplishments in aflatoxin research in recent years?

Dr. FINNEY. ARS accomplishments for the control of aflatoxin will be provided for the record.

[The information follows:]

Identified peanut germplasm resistant to *A. flavus* invasion and/or aflatoxin production that has the potential for hybridization to combine resistance with acceptable commercial characteristics.

Developed ear inoculation and kernel sampling procedures for efficient and accurate identification of corn lines resistant to *A. flavus*.

Demonstrated that competitive exclusion by naturally occurring nontoxic mold "cousins" can control aflatoxin-producing fungi. With cotton, use of these nontoxic molds reduced aflatoxin contamination by 90%. The technology is now patented.

Explained why major aflatoxin outbreaks occur when hybrids developed for the Corn Belt are exposed to high evening temperature >75°F during kernel maturation in the Southern United States.

Developed DNA probes and analysis of vegetative compatibility groupings to understand ecological niches of *A. flavus* and distribution of atoxigenic forms in corn and cotton production.

Identified a "Master Switch" gene that triggers aflatoxin production. This greatly aids the selection of aflatoxin resistant crops because searches can now be made for varieties containing naturally-occurring plant chemicals that inhibit this gene.

Mr. DURBIN. By location, please indicate the dollars and staff years devoted to aflatoxin research in fiscal years 1993, 1994, and 1995.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA	\$886,600	2	\$786,500	2	\$793,100	2
Dawson, GA	760,900	2	773,100	2	780,000	2
Miss. St., MS	600,900	2	610,300	2	615,800	2
New Orleans, LA	2,275,000	10	2,532,900	11	2,555,500	11
Peoria, IL	1,325,400	7	1,233,400	6	1,243,700	6
Tifton, GA	556,800	3	565,900	3	570,600	3
Headquarters	891,900	—	891,900	—	891,900	—
Total	7,297,500	26	7,394,000	26	7,450,600	26

AQUACULTURE RESEARCH

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with aquaculture research.

Dr. FINNEY. The work ARS is doing in aquaculture, by location, will be provided for the record.

[The information follows:]

Auburn, AL—Immunity, diagnosis, and control of diseases and parasites of cultured fish.

Davis, CA—Tropical aquaculture, culture, and feed technology.

Kanehoe, HI—Requirements and sources of nutrients for marine shrimp.

New Orleans, LA—Improving flavor quality of farm-raised catfish.

Pine Bluff, AR—Aquaculture production and processing technology.

Stoneville, MS—Improving breeding, genetics, and endocrinology of catfish.

Lane (Tishomingo), OK—Improving flavor and storage quality of catfish and improving methods to increase catfish production and efficiency.

Kearneysville, WV—Water quality control.
College Station, TX—Food safety of catfish.

Mr. DURBIN. What are some of the agency's research accomplishments in the field of aquaculture?

Dr. FINNEY. Some examples of the agency's research accomplishments in the field of aquaculture will be provided for the record. [The information follows:]

ARS showed, among several strains of crossbred channel catfish, improved resistance to enteric septicemia. Scientists demonstrated feasibility for production of all male catfish offspring for faster growth. ARS produced transgenic catfish with lytic peptide genes for increased disease resistance. ARS developed a 30-minute test for detecting enteric septicemia-infected catfish. Scientists demonstrated the utility of high-resolution airborne remote sensing for predicting algae crops in aquaculture ponds by correlating multi-spectral readings with pigment and characterized the inhibition of algae growth, photosynthetic efficiency, and pigment composition in response to herbicides commonly used for controlling aquatic plants. ARS established the biochemical details of off-flavor biosynthesis using bioregulators leading to a potential strategy of controlling the water quality problems that contribute to off-flavor.

Mr. DURBIN. By location, what is the funding and staff for aquaculture research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Auburn, AL	\$846,400	3.0	\$857,600	3.0	\$864,800	3.0
Pine Bluff, AR			125,000	.5	126,000	1.0
Hilo, HI	1,642,100		1,642,100			
Kanehoe, HI	162,700	1.0	164,700	1.0		
New Orleans, LA	678,200	3.2	688,000	3.1	693,800	3.1
Stoneville, MS	1,016,400	3.0	1,157,400	3.0	1,167,100	3.0
Lane, OK	512,300	2.0	518,800	1.5		
Kearneysville, WV	1,472,200		1,472,200		1,472,200	
Fargo, ND	325,000					
College Sta., TX	371,600		371,600		371,600	
Total	7,026,900	12.2	6,997,400	12.1	4,695,500	10.1

BARLEY YELLOW DWARF VIRUS

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with barley yellow dwarf virus, by location.

Dr. FINNEY. The goal of ARS barley yellow dwarf virus—BYDV—research program is to develop and transfer to cereal crop producers technology to prevent or reduce economic losses due to BYDV. This is to be achieved by development of crop germplasm lines and new varieties with improved BYDV infection immunity, resistance, or tolerance. In addition, there will be development of cultural production systems based on BYDV resistant or tolerant crop varieties and suppression of BYDV insect vector populations.

The purpose of the research at Ithaca, New York, is to characterize the viral pathogen and develop technologies to detect the virus in plants and in insect vectors. This research includes determination of the structure, reproduction, and movement of the virus in the host plant and in insect vectors.

The purpose of the research at West Lafayette, Indiana, is to determine which insect species spread the various strains of BYDV

and to determine the biology of the insects, feeding behavior on plants, and migration habits within fields and over long distances.

The research at Brookings, South Dakota; University Park, Pennsylvania; and Urbana, Illinois, is directed toward evaluation of plant germplasm for resistance to the virus and several species of insect vectors that feed on cereal crops, development of improved germplasm and new varieties of cereal crops, and development of disease management strategies based on the biology of the disease under natural conditions.

The research at Lincoln, Nebraska, is concerned with the development of BYDV strain detection and identification methods.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Barley yellow dwarf is considered to be the most important virus disease of small grain cereals in the world, affecting primarily barley, oats, triticale, and wheat. It occurs extensively in the United States and there is a need to develop crop varieties resistant to barley yellow dwarf as quickly as possible.

Mr. DURBIN. By location, what is the funding and staff of barley yellow dwarf virus research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Brookings, SD	\$62,800	0.1	\$78,200	0.1	\$78,900	0.1
Lincoln, NE	29,300	0.1	29,800	0.1	30,000	0.1
Ithaca, NY	171,000	1.0	240,700	1.0	242,700	1.0
Univ. Park, PA	41,100	0.1	41,800	0.1	42,200	0.1
Urbana, IL	279,300	2.0	283,200	2.0	285,600	2.0
W. Lafayette, IN	261,300	0.2	263,200	1.0	265,400	1.0
Aberdeen, ID	15,200	.....	15,200	.....	15,300	.....
Total	860,100	3.5	952,100	4.3	960,100	4.3

BIODEGRADABLE PLASTIC

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with biodegradable plastic, by location.

Dr. FINNEY. Development of totally biodegradable polymer materials based on starch is a major emphasis of research at the National Center for Agricultural Utilization Research—NCAUR, Peoria, Illinois. At NCAUR, scientists are developing composites of starch and other biodegradable polymers using extrusion and injection molding technologies to produce the water resistance, flexibility and strength required for many one-time-use plastic articles. To fully meet the performance requirements and retain the biodegradable property of these products, processing aids and additives must be identified and methods to assess properties and biodegradability developed. Development of films from another natural biopolymer called pectin, is the focus of biodegradable research at the Eastern Regional Research Center in Philadelphia, Pennsylvania. Once the appropriate conditions for film formation are identified, the film properties such as gaseous permeability, flexibility and strength of the polymer formulations are defined to establish market potential. At the Western Regional Research Center in Albany, California, an objective is to develop films that are both biodegradable and edible. These formulations utilize many natural biopolymers including pro-

teins, vegetable oils and carbohydrates to produce edible films for coating food products, fruits, vegetables and partially processed items for the food service industry. Moisture retention and lack of color and flavor are the properties that these films must meet.

Mr. DURBIN. What are some of the Agency's accomplishments in this field of research?

Dr. FINNEY. For the first time a new process has been identified for the formation of unique inclusion complexes between the amylose component of starch and low molecular weight polymers. This process offers the possibility of forming starch polyester composites that should be totally biodegradable. Water resistance and strength of starch composites were greatly increased by coating with various biodegradable polymers. Starch foam trays, similarly coated were found to be suitable for use with hot water. Disposable knives, forks and spoons were injection molded from various formulations and are being evaluated. Market opportunities for these products are being pursued through various CRADAs with industrial organizations.

Mr. DURBIN. By location, what is the funding and staff for biodegradable plastic research for fiscal years 1993, 1994, and 1995? [The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Peoria, IL	\$1,455,200	7.4	\$1,471,500	7.4	\$1,483,800	7.4
Philadelphia, PA	710,600	3.1	721,100	3.1	727,200	3.1
Albany, CA	492,400	2.4	501,100	2.4	505,300	2.4
Total	2,658,200	12.9	2,693,700	12.9	2,716,300	12.9

BIOTECHNOLOGY RESEARCH AND DEVELOPMENT CORPORATION

Mr. DURBIN. Please describe for the Committee the research underway at the Biotechnology Research and Development Corporation.

Dr. FINNEY. The Biotechnology Research and Development Corporation—BRDC—funds research projects in several different scientific disciplines related to agricultural biotechnology. In the area of plant molecular biology, BRDC supports the development of technologies that can be used by government, academic and corporate researchers to facilitate the development of transgenic plants. BRDC supports research on the molecular biology of lower organisms—such as fungi and bacteria—with the aim of developing new fermentation technologies for converting low cost agricultural feedstocks into higher value products. Related programs aimed at developing new, biocatalytic routes to synthesize high value intermediates from agricultural feedstocks are also supported, as are projects to develop improved fermentation process control sensors. Development of technology for the efficient separation and recovery of products from fermentation or biocatalytic production systems is also being funded by BRDC. BRDC supports research programs to identify natural products—compounds already present in nature—that can be used as environmentally friendly herbicides, pesticides, or fungicides.

ANIMAL HEALTH CONSORTIUM

Mr. DURBIN. Please describe the research carried out by the Animal Health Consortium headquartered at Ames, Iowa.

Dr. FINNEY. The Animal Health Consortium is managed for the USDA by the Biotechnology Research and Development Corporation—BRDC. In 1990, BRDC established its Animal Health Care Division to carry out this management function. USDA funds the Animal Health Consortium using the same grant that provides federal funding to the BRDC. The BRDC Animal Health Care Division supports research projects in both federal and academic laboratories focused on topics such as the development of vaccines and related technology for diseases affecting production and companion animals; the identification of genetic markers useful for predicting litter size in pigs and milk production in cattle; and the development of state-of-the-art animal cell-culture technology, leading to the development of leaner, more robust pigs and transgenic animals useful in human pharmaceutical and therapeutic applications. To date, a total of 25 projects have been funded at six different institutions by the BRDC Animal Health Care Division.

Mr. DURBIN. Please discuss some of the Corporation's research accomplishments.

Dr. FINNEY. Some of the recent research accomplishments supported by BRDC funding will be provided for the record.

[The information follows:]

Starch Encapsulation. This technology developed by ARS scientists allows farmers to deliver pest control agents in a sustained release and biodegradable manner. The amount of control agent that must be applied is reduced, decreasing the potential for groundwater and offsite pollution without reducing the level of pest control. The technology works well with natural biological control agents as well as chemical control agents. The technology, which utilizes a commodity agricultural product (corn starch), has been licensed to three companies, and is now in commercial development. Successful introduction of starch encapsulated pest control products will provide a major new market for U.S. corn.

New "natural biocontrol agents". Compounds isolated from certain fungi have been found to be useful for controlling various insect pests. These naturally occurring, biodegradable compounds are now being evaluated by several BRDC shareholder companies for use as environmentally friendly insecticides, fungicides and ectoparasiticides.

"Ribozyme". BRDC supported scientists developed a nucleic acid molecule that acts like an enzyme and can be "customized" to recognize and catalytically inactivate viruses in crop plants, as well as the AIDS virus in humans. This technology has been licensed to a major international pharmaceutical company.

"Plant Super Promoter". A promoter is a component of DNA that determines how strongly a particular gene is expressed. BRDC-supported scientists have developed a "super promoter" for plant genes that is 20 times more active than any other known plant gene promoter. Using this "super promoter" in conjunction with specific genes introduced into agriculturally important plants (e.g. specific insect-toxic proteins) helps ensure that the desired new traits are present at levels sufficient to provide maximum benefit to the plant.

"Porcine Embryonic Stem Cells". BRDC-supported scientists have developed methodology for culturing embryonic stem (ES) cells from pigs in artificial media. ES cells are cells isolated from early embryos. Each ES cell has the potential to contribute to the development of a complete pig. When grown in culture, ES cells can be genetically altered in specific ways and then used to produce new lines of pigs that will exhibit the specific genetic characteristics. This technology has been licensed for use in producing pigs that will be immunologically compatible with humans, and therefore able to provide organs, e.g., hearts, kidneys, etc., for transplantation. The ES cell technology will also be used to produce superior pigs with regard to carcass quality and disease resistance.

Mr. DURBIN. What private funds does the Corporation receive?

Dr. FINNEY. Each company participating as a full shareholder in the BRDC consortium contributes \$200,000 per year to BRDC. Cooperating Research Companies contribute \$50,000 per year, and receive only limited rights to BRDC developed technology. Corporations participating as full shareholders or Cooperating Companies will be provided for the record.

[The information follows:]

Full Shareholders:

Amoco Technology Company (1988-present)
 American Cyanamid Company (1988-present)
 Alexion Pharmaceuticals, Inc. (1993-present)
 The Dow Chemical Company (1988-present)
 ECOGEN, Inc. (1988-1992)
 Hewlett-Packard Company (1988-present)
 IMCERA Group, Inc. (1988-present)

Cooperating Companies:

GalaGen, Inc. (1993-present)
 Pig Improvement Company (1993-present)

Mr. DURBIN. Please provide a table for the record indicating a funding history for the Corporation.

[The information follows:]

BIOTECHNOLOGY RESEARCH AND DEVELOPMENT CORPORATION CALENDAR YEAR FUNDING HISTORY

[In thousands of dollars]

Source of funding	1988	1989	1990	1991	1992	1993	Total
Federal (USDA)	\$1,980.0	\$1,800.0	\$3,359.4	\$2,182.0	\$2,542.0	\$2,542.0	\$14,405.6
State (IL Department of Agriculture)	1,000.0	1,000.0	1,000.0	.....	60.0	200.0	3,260.0
Corporate Participants	280.0	2,150.0	1,450.0	1,200.0	1,150.0	1,233.3	7,463.3
Royalties, Interest, Licensing Fees and Other Income	133.1	298.2	439.3	275.3	103.1	49.5	1,298.5
Total	3,393.1	5,248.2	6,248.7	3,657.3	3,855.1	4,024.8	26,427.4

BLUEBERRY/CRANBERRY RESEARCH

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with blueberries and cranberries, by location.

Dr. FINNEY. A description of blueberry and cranberry research by location will be provided for the record.

[The information follows:]

Beltsville, MD.—Blueberry germplasm evaluation, variety development, and genome mapping; adaptation of blueberry root systems to upland pH neutral soils.

Booneville, AR.—Evaluation of existing blueberry varieties for adaptation to south central production areas and development of improved cultural practices for blueberry production.

Chatsworth, NJ.—Genetics and breeding of improved varieties and pest control of blueberries and cranberries; epidemiology and biological control of diseases of cranberries.

Corvallis, OR.—Preservation and evaluation of germplasm.

Kearneysville, WV.—Aquaculture-linked hydroponic cropping systems.

Lane, OK.—Development of postharvest practices to increase shelf life, reduce disease losses, and increase marketability of blueberries.

Peoria, IL.—Identification, evaluation, and development of natural products to control postharvest fungal diseases of blueberries.

Poplarville, MS.—Breeding, field testing, and introduction of new blueberry varieties adapted to the Gulf States; development of improved cultural practices for blueberry production; development of improved disease control methods.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Blueberries and cranberries are important crops nationwide. Production of these crops is increasing in some areas, such as the Pacific Northwest and the Southern United States. In addition, production of these crops is suitable for small farmers. However, a variety of problems limit the production potential for these crops in many areas. These include availability of varieties adaptable to marginal soils, appropriate cultural practices, and suitable pest management strategies during production and postharvest, and suitable production and processing equipment. ARS addresses these needs through its current research program activities.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research.

Dr. FINNEY. In 1993, ARS jointly released, with the New Jersey Agricultural Experiment Station, a new highbush blueberry cultivar named Legacy. This variety produces good yields of high-quality fruit.

A small group of proteins has been identified in blueberries that may function in development of cold hardiness. The genes for these proteins can be used to improve the adaptability of blueberries and other small fruit crops to cold environments.

A genetic map of blueberry has been constructed allowing genes involved in the control of dormancy and cold hardiness development to be located. Genetic markers near these genes will allow these traits to be more easily followed during breeding.

Molecular methods have been developed for improved detection of viruses in blueberries and cranberries.

Mr. DURBIN. By location, what is the funding and staff for blueberry/cranberry research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Booneville, AR	\$45,600	0.5	\$46,100	0.5	\$46,500	0.5
Beltsville, MD	462,700	1.9	575,300	1.9	580,100	1.9
Poplarville, MS	374,000	1.5	379,200	1.5	382,400	1.5
Chatsworth, NJ	566,900	2.8	571,400	2.8	--	--
Corvallis, OR	68,000	0.2	--	--	--	--
Peoria, IL	47,800	0.2	48,500	0.2	48,900	0.2
Kearneysville, WV	109,000	0.9	109,100	0.9	110,000	0.9
Total	1,674,000	8.0	1,729,600	7.8	1,167,900	5.0

BRUCELLOSIS RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with brucellosis research, by location.

Dr. FINNEY. The ARS bovine brucellosis program is conducted at the National Animal Disease Center in Ames, Iowa, to develop attenuated and genetically engineered vaccines, to improve vaccine methodology, to improve diagnostic procedures, to characterize the genes in the bacteria that code for virulence and immunogenicity, and to determine mechanisms of genetic resistance to *Brucella* infection.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. The National Animal Disease Center has demonstrated that a naturally occurring mutant of *Brucella abortus* vaccine strain 19, RB51, will immunize cattle without sensitizing them to the current serologic tests and without circulating infectious bacteria. This mutant may have potential use for wildlife and export cattle. A patent application has been filed for a rapid DNA-based assay to identify and characterize *B. abortus* strains in diagnostic laboratories. A similar assay is being developed for fingerprinting DNA's from *B. abortus* for livestock and wildlife epidemiologic studies.

Mr. DURBIN. By location, what is the funding and staff for brucellosis research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and scientific staff for brucellosis research for fiscal year 1993 was \$2,829,300 and 9 scientists. For fiscal years 1994 and 1995, estimated funding is \$2,740,300 and \$2,763,200, respectively, with 8 scientific staff in each year. The brucellosis program is located at the National Animal Disease Center in Ames, Iowa.

CALICIVIRUS

Mr. DURBIN. Please describe the work you have underway on calicivirus.

Dr. FINNEY. The ARS research program on caliciviruses was terminated at the end of FY 1992 and the funding resources were redirected at the National Animal Disease Center, Ames, Iowa, to high-priority livestock industry research on bovine and cervid tuberculosis and on porcine respiratory and reproductive syndrome—mystery swine disease. The ARS scientist previously conducting calicivirus research was transferred to the high-priority Newcastle disease research program at Athens, Georgia.

Mr. DURBIN. What was the need for this research?

Dr. FINNEY. The calicivirus program permitted ARS to compare genetic variability in the capsid proteins of porcine and feline caliciviruses using molecular techniques. This information may assist in the eventual development of calicivirus vaccines for pigs and other animals.

Mr. DURBIN. By location, what is the funding and staff for calicivirus research?

Dr. FINNEY. In fiscal year 1993, the funding and scientific staff for calicivirus research was \$219,900 and 1 scientist. This was redirected in fiscal year 1993 to research on bovine and cervid tuberculosis and on mystery swine disease at the National Animal Disease Center, Ames, Iowa. The National Animal Disease Center no longer conducts research on porcine caliciviruses.

CANOLA RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with canola research, by location.

Dr. FINNEY. We have research on canola at two locations. At Tifton, Georgia, effort is underway to improve seed production and seed quality, and to evaluate germplasm of canola. A minor effort

at Watkinsville, Georgia, involves evaluation of water stress response.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Research on canola is needed to identify or to develop cultivars which are adapted to the various climatic growing regions in the U.S. This is the focus of the ARS program in Georgia. There is also a need to develop cold hardy cultivars for use in the Midwest where current cultivars are subject to winter injury. Although ARS is not conducting such research, a commercial seed company in Iowa is addressing cold hardiness.

Mr. DURBIN. What are the uses of this oil?

Dr. FINNEY. The current use of canola is as a cooking oil. Other uses include food service shortenings, salted snack foods, and margarine. Canola oil is important as it has the lowest saturated fat level of any commercially available oil.

Mr. DURBIN. What is the domestic usage and the amount imported?

Dr. FINNEY. Domestic usage of canola oil was about 315,000 metric tons in 1991, of which 98 percent was imported; about half from Canada and half from Europe. In 1992 the usage was about 414,545 metric tons, and in 1993 the projected usage is about 529,909 metric tons, of which 80 percent is expected to be imported.

Mr. DURBIN. By location, what is the funding and staff for canola research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Tifton, GA	\$145,900	1.0	\$74,200	0.5	\$74,800	0.5
Watkinsville, GA .....	.....	.....	69,000	0.15	69,600	0.15
Total	145,900	1.0	143,200	0.65	144,400	0.65

COMPOSTING RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with composting research by location.

Dr. FINNEY. Research at the different locations, with the indicated objectives will be provided for the record.

[The information follows:]

Clay Center, Nebraska.—Evaluate composting procedures for feedlot manures in terms of weed seed kill, nutrient value of composted manure compared to non-composted manure and commercial fertilizer for irrigated corn land, benefits of compost as a winter cover, and effects of the composting process on adjacent surface and ground water quality.

Corvallis, Oregon.—Determine feasibility and costs of composting straw from grass seed production as an alternative to burning and determine benefits derivable from use of this compost.

Lincoln, Nebraska.—Evaluating fraction of nitrogen in manures that is lost during the composting process, balance of nutrients provided by compost and its effectiveness in production and reduction in weight during composting.

Rodale Institute Research Center, Kutztown, Pennsylvania.—Developing reliable methods for on farm co-composting of agricultural and municipal wastes and evaluating benefits derivable from use of these composts.

Beltsville, Maryland.—Developing risk assessment guidelines and criteria, with EPA, for land application of municipal solid wastes and sewage sludges and

composts and mixtures containing them, in terms of allowable levels of trace elements.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. A successful low-input on farm composting system has been developed for utilizing straw from grass seed production. Fractions of nitrogen loss from manures during composting have been measured and constitute a major portion of the nitrogen that is available to crops when the manure is applied directly to the field. The high cost of transporting manure from feedlots to fields can be reduced about 20 percent by composting, but could be reduced much more if the manure was not mixed so deeply into the soil in the feedlots. Soil compaction and other methods for reducing this mixing are being evaluated. On farm composting of manure results in some nitrate accumulation under the composting and storage areas if they are not on a "floor" impermeable to water. Means for hydraulic and biologic recovery of this nitrate are under consideration. Newspapers, cafeteria wastes—including paper, leaves, biodegradable starch-based plastic, leaves and chicken and dairy manures have been co-composted into products which all appear acceptable for landscaping, horticultural or agricultural use.

Mr. DURBIN. By location, what is the funding and staff for composting research for fiscal years 1993, 1994, and 1995.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Clay Center, NE	\$477,000	1.5	\$483,100	2.0	\$487,200	2.0
Corvallis, OR	230,000	1.4	232,900	1.4	234,800	1.4
Lincoln, NE			20,300	0.2	20,300	0.2
Beltsville, MD	172,200	0.7	183,500	0.8	1,185,000	2.8
Total	879,200	3.6	919,800	4.4	1,927,300	6.4

ENDOPHYTE RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with endophyte research at the Universities of Missouri and Arkansas.

Dr. FINNEY. ARS-supported cooperative research on endophytes at the Universities of Missouri and Arkansas will be provided for the record.

[The information follows:]

UNIVERSITY OF ARKANSAS

Identification of Toxins in Endophyte-Infected Tall Fescue.

Genetic Evaluation of Acremonium in Tall Fescue Germplasm for Drought Resistance.

Identification of Cattle with Innate Resistance to Tall Fescue Toxins.

UNIVERSITY OF MISSOURI

Involvement of the Acremonium Endophyte in Tall Fescue in ABA-mediated Gas Exchange Responses.

Interactions among Acremonium, Rhizoctonia and Molodogyne in Tall Fescue.

Endophyte-free and Endophyte-infected Tall Fescue : Biochemical Resistance Mechanism.

Effects of Ergovaline in Adrenergic/Dopaminergic Receptor Function and Second Messenger Pathways.

Quantification of and Dose of Endophyte/Grass Metabolites in Cattle which Contribute to Fescue Toxiosis.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. The purpose of this research is to reveal the mechanisms by which the endophyte fungi infecting tall fescue forage grasses, cause health and growth performance problems in animals grazing these grasses. This information is expected to result in identification of means to counteract the endophyte effects and avoid the decline in performance and health of animals grazing these grasses.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. The accomplishments that have come from the endophyte research will be provided for the record.

[The information follows:]

1. Ergovaline has been identified as the primary toxin responsible for reducing peripheral blood flow and decreasing prolactin secretion in cattle.
2. As little as 16 ppb ergovaline is sufficient to elicit a measurable decrease in blood flow to the extremities of cattle as measured by temperature response in growth chamber studies.
3. Ergovaline and other alkaloid toxins present in tall fescue act as inhibitors to the productions of the cAMP enzyme system necessary for normal nerve and kidney functions in cattle.
4. Rhizoctonia is a serious soil-borne pathogen that can affect the persistence of tall fescue.
5. Near infrared reflectance system (NIRS) techniques were developed that allow rapid, economical screening of tall fescue germplasm collections for the presence of the chitinase enzyme which is involved in plant disease resistance.
6. The presence of the endophyte enhances the production of abscisic acid by tall fescue in response to drought which results in moisture conservation by the plant.
7. Acremonium endophytes have been identified that do not produce ergovaline and one of these has been successfully transferred to high-digestibility, endophyte-free tall fescue germplasm.

Mr. DURBIN. What is the funding and staff for endophyte research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding for endophyte research for fiscal year 1993 was \$177,800; in 1994 and 1995 is \$177,400. The Universities of Arkansas and Missouri provide staff to conduct the research.

ETHANOL RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with ethanol research, by location.

Dr. FINNEY. We have ethanol research at three locations focused on developing technologies and processes that reduce production costs and increase the value of co-products. The National Center for Agricultural Utilization Research at Peoria, Illinois is developing improved biochemical technologies and fermentation systems for conversion of agricultural commodities—primarily corn—to ethanol and technology to convert the corn residues from ethanol fermentation into high-value products. Researchers at the Eastern Regional Research Center in Philadelphia, Pennsylvania are working on optimal process technologies and systems to recover ethanol, remove water and separate co-products from fermentation media. Research at the Western Regional Center at Albany, California is focused on developing integrated pre-treatment, biological conversion and product recovery processes to improve conversion rates and yields of ethanol and co-products.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. Three novel co-products called "hopanoids" were identified during the production of ethanol by the bacterium *Zymonovas mobilis*. These new compounds are being evaluated for their potential value as pharmaceuticals, agricultural chemicals or other industrial application. Preliminary results indicate that one of these compounds possesses antiinflammatory activity, and another is toxic to certain plant pests. New enzymatic methods were developed to convert corn fiber to the anticarcinogenic sweetener, xylitol. A pilot scale membrane separation unit with improved energy efficiency and recovery of ethanol was designed and is being evaluated. Evaluation of a new enzyme that will convert cellulose to glucose has the potential to ferment xylans contained in corn fiber to ethanol.

Mr. DURBIN. By location, what is the funding and staff for ethanol research for Fiscal Years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA			\$215,900	1.1	\$217,700	1.1
Peoria, IL	\$1,109,200	3.0	1,775,400	5.0	1,790,300	5.0
Phila., PA	833,300	3.3	1,580,000	6.3	1,593,200	6.3
Total	1,942,500	6.3	3,571,300	12.4	3,601,200	12.4

FRUIT FLY ERADICATION PROGRAM

Mr. DURBIN. What are the plans for the fruit fly eradication project in Hawaii during fiscal year 1995?

Dr. FINNEY. ARS continues to place a high priority on all programs which directly support elimination of fruit flies from Hawaii. However, the medfly pilot test on Kauai/Niihau initiated by ARS in September 1990 has been temporarily suspended. ARS has concluded that eradication of medfly using sterile insects alone is not operationally feasible because of the high medfly populations in coffee that have developed as a result of greatly expanded coffee production acreage in recent years as sugarcane acreage has declined. Our scientists are now researching environmentally compatible methods of reducing native medfly populations in commercial coffee. The eradication pilot study will resume when the native medfly populations can be reduced to a level that the sterile fly releases can be effective. ARS expects to resume the release program in the Fall of 1994. ARS will continue to work with APHIS, the University, State and local government, and the private sector to develop and demonstrate through pilot tests, safe and publicly acceptable technology for fruit fly eradication.

Mr. DURBIN. By location, what is the budget for this project for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The budget allocated specifically for fruit fly eradication research on Hawaii in fiscal year 1993 was \$3,064,000. Estimated budgets for 1994 and 1995 are \$3,104,000 and \$3,124,300, respectively.

GERMPLASM

Mr. DURBIN. By location, what is the funding and staff for germplasm facilities for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The estimated ARS funding and scientist staff for the major plant germplasm repository and research facilities will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Davis, CA	\$573,100	1.0	\$582,300	1.0	\$587,200	1.0
Riverside, CA	385,200	1.0	390,600	1.0	393,900	1.0
Ft. Collins, CO	2,466,200	4.5	2,503,100	4.5	2,524,200	4.5
Washington, DC	417,600	2.4	510,300	2.4	514,500	2.4
Miami, FL	473,600	1.0	481,200	1.0	.....	.....
Griffin, GA	1,511,500	4.6	1,529,000	4.6	1,541,800	4.6
Honolulu/Hilo/HI	395,300	1.0	399,300	1.0	458,100	1.0
Ames, IA	1,688,200	4.6	1,704,900	4.6	1,719,200	4.6
Aberdeen, ID	854,400	2.2	858,500	2.2	865,700	2.2
Urbana, IL	620,900	2.4	629,200	2.4	634,500	2.4
Beltsville, MD	4,329,200	11.8	3,925,300	11.8	3,958,200	11.8
Stoneville, MS	126,200	0.8	319,700	0.8	322,400	0.8
Oxford, NC	46,600	.....	47,200	.....	.....	.....
Fargo, ND	492,100	1.7	306,500	1.7	309,100	1.7
Geneva, NY	1,328,600	1.9	1,334,100	1.9	1,345,300	1.9
Corvallis, OR	576,900	2.0	781,000	2.0	787,500	2.0
Mayaguez, PR	729,500	2.0	738,900	2.0	1,230,300	3.0
Brownwood, TX	118,400	0.6	120,000	0.6	.....	.....
College Sta., TX	553,400	1.7	559,900	1.7	685,600	1.7
Logan, UT	145,500	0.7	147,500	0.7	148,800	0.7
Pullman, WA	1,126,000	3.9	1,140,100	3.9	1,149,600	3.9
Madison/Sturgeon Bay, WI	243,400	2.1	246,100	2.1	248,200	2.1
St. Croix, VI	313,700	0.1	316,400	0.1	319,100	0.1
Headquarters	861,800	.....	861,800	.....	861,800	.....
Total	20,377,300	54.0	20,432,900	54.0	20,605,000	53.4

Mr. DURBIN. For the record, please list the germplasm collections that are maintained by ARS.

[The information follows:]

Davis, CA—almond, fig, grape, kiwi, mulberry, olive, persimmon, pistachio, pomegranate, stone fruit, and walnut.

Riverside, CA—citrus and related genera, and dates.

Salinas, CA—lettuce genetic stocks.

Forth Collins, CO—base seed collection of major economic crops.

Washington, DC—woody landscape genera.

Miami, FL—annona, avocado, mango, passiflora, sugarcane.

Griffin, GA—cowpea, melon, peanut, pepper, sorghum, and sweetpotato.

Tifton, GA—pearl millet.

Hilo, HI—acerola cherry, atemoya, breadfruit, carambola, guava, litchi, macadamia, papaya, passion-fruit, peach palm, pili nut, pineapple, and rambutan.

Ames, IA—alfalfa, cabbage, maize, melon, sugarbeet, sunflower, and soybean genetic stocks.

Aberdeen, ID—barley, oat, rice, rye, triticale, and wheat.

Urbana, IL—mainze genetic stocks and soybean.

Columbia, MO—triticale and wheat genetic stocks.

Oxford, NC—tobacco.

Fargo, ND—durum wheat genetic stocks and flax.

Geneva, NY—apple, brassicas, celery, clover, hardy grape, squash, and tomato.

Corvallis, OR—blackberry, blueberry, cranberry, current, filbert, gooseberry, hop, mint, pear, raspberry, and strawberry.

Mayaguez, PR—banana, Brazil nut, cacao, coffee, mango, and plantain.

Brownwood, TX—chestnut, hickory, and pecan.

College Station, TX—cotton and cotton genetic stocks, and sorghum genetic stocks.

Logan, UT—range grass collection.

Pullman, WA—alfalfa, bean, chickpea, grasses, lentil, onion, pea and pea genetic stocks, and safflower.

RUSSIAN INSTITUTE OF PLANT INDUSTRY

Mr. DURBIN. What is ARS's relationship with the Institute of Plant Industry in St. Petersburg, Russia?

Dr. FINNEY. ARS has had a long-standing interest in and interaction with the N.I Vavilov Institute—VIR—in St. Petersburg. ARS has exchanged plant genetic resources with VIR and assisted with visits of scientists to and from the Institute. VIR has facilitated numerous plant collecting trips of ARS scientists over the past seven years. More recently, the agency developed a program of cooperation which covers germplasm collecting, evaluation, preservation and documentation in addition to exchange. ARS and VIR are co-operating to develop a computerized inventory of plant germplasm.

MAJOR GERmplasm COLLECTIONS

Mr. DURBIN. For the record, please list other major germplasm collections and their locations.

Dr. FINNEY. Several countries maintain large and diverse major collections, including Brazil, Canada, China, Colombia, Ethiopia, India, Mexico, Peru, and Russia. Large, crop-specific collections are also held at international agricultural research centers of the Consultative Group on International Agricultural Research (CGIAR) in developing countries. Major germplasm collections and their locations will be provided for the record.

[The information follows:]

Crop	Location and organization
Bean	Cali, Colombia—International Center for Tropical Agriculture.
Chickpea	Hyderabad, India—International Crops Research Institute for the Semi-Arid Tropics.
Cowpea	Ibadan, Nigeria—International Institute for Tropical Agriculture.
Maize	El Batan, Mexico—International Center for Maize and Wheat Improvement.
Peanut	Hyderabad, India—International Crops Research Institute for the Semi-Arid Tropics.
Pearl Millet	Hyderabad, India—International Crops Research Institute for the Semi-Arid Tropics.
Pidgeonpea	Hyderabad, India—International Crops Research Institute for the Semi-Arid Tropics.
Potato	Lima, Peru—International Potato Center.
Rice	Los Banos, Philippines—International Rice Research Institute.
Sorghum	Hyderabad, India—International Crops Research Institute for the Semi-Arid Tropics.
Wheat	El Batan, Mexico—International Center for Maize and Wheat Improvement.

GRAPE PHYLLOXERA

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with grape phylloxera, by location.

Dr. FINNEY. ARS research on grape phylloxera is conducted in two locations. At Davis, California, research is conducted on the cause of the death of newly planted phylloxera-resistant rootstocks in young replanted vineyards. At Fresno, California, grape rootstocks with resistance to phylloxera, and other soilborne pests, are being developed by conventional breeding and evaluated. Using biotechnology, new genes providing resistance to soilborne pests are also being introduced into grapes.

Mr. DURBIN. Please describe the need for this research.

Dr. FINNEY. Grape phylloxera, also known as the grapevine root louse, is a root-sucking insect pest of grape plants. Prior to recent years, this pest did not cause significant economic losses in California because of the general resistance of the most commonly used grape rootstock. In the last 1980's a new strain of phylloxera appeared which overcomes this resistance and kills or severely debilitates the vines. Economic losses have been particularly severe in the coastal wine-growing regions of California. The pest is now widespread in California, including the interior valleys, and the Pacific Northwest. Affected plants must be pulled out and vineyards replanted. Grape rootstocks resistant to phylloxera are available, but they suffer other shortcomings, such as susceptibility to plant viruses and soilborne diseases.

Mr. DURBIN. By location, what is the funding for grape phylloxera research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding for ARS research on grape phylloxera research at Davis, California, for fiscal years 1993, 1994, and 1995 is \$56,600; \$157,600; and \$158,900, respectively. The funding at Fresno, California, for fiscal years 1993, 1994, and 1995 is \$90,700; \$91,700; and \$92,500 respectively.

GRAPE VIROLOGY RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with grape virology research by location.

Dr. FINNEY. ARS conducts grape virology research at Davis, California. The research involves determining the epidemiology of virus and virus-like diseases, including development of sensitive and specific detection techniques, determination of the causes of suspected virus diseases, and identification of factors involved in the spread of grapevine viruses; and development of methods to reduce or eliminate losses caused by grapevine viruses and virus-like agents.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Grape growers in California and Oregon are currently replanting large numbers of grapevines because of decline caused by the grape phylloxera. Problems have arisen because the phylloxera-resistant replant rootstocks are generally susceptible to virus diseases that are introduced into the vineyard via infected scionwood. Often the Scionwood appears healthy, but is latently infected with one or more viruses that can move into the susceptible rootstock. Subsequently, the plant becomes debilitated. New and improved methods are needed to rapidly detect these viruses to ensure that growers use only virus-free material for both rootstocks and scionwood. Current virus detection and identification methods are very time-consuming. In addition, the relative tolerances of available phylloxera-resistant rootstocks to viruses are not known and need to be determined. Finally, improved methods are needed to eliminate viruses and virus-like agents from infected grapevine propagating material.

Mr. DURBIN. What are some of the agency accomplishments in this field of research?

Dr. FINNEY. At Davis, California, existing tissue culture techniques have been adapted for the elimination of grape viruses and other grape pathogens. Sensitive technology has been developed for detecting grape leafroll and fanleaf disease pathogens for use in

certification programs. A recent disease epidemic in Northcoast vineyards in California was associated with latent viruses. Grape leafroll viruses have been experimentally transmitted by mealy bugs in California.

Mr. DURBIN. By location, what is the funding and staff for grape virology research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. ARS conducts grape virology research at Davis, California. The funding for this research in fiscal years 1993, 1994, and 1995 is \$113,400, \$215,200, and \$217,000, respectively. The research is conducted by 1 scientist in each fiscal year.

GRASSHOPPER AND MORMON CRICKETS

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with research on grasshoppers and Mormon crickets.

Dr. FINNEY. The ARS Rangeland Insect Laboratory, Bozeman, Montana, conducts a research program on grasshopper and Mormon cricket control which focuses on environmentally compatible, economical, and publicly-acceptable control technology. This includes the use of microbial pesticides, egg parasites, and the reduction of pesticides using baits in place of sprays. Additionally, the Bozeman laboratory has greatly increased the knowledge of grasshopper biology and grasshopper population dynamics. This effort has resulted in the development of an expert system called Hopper to provide management advice to ranchers. Taxonomic support for the program is provided by the Systematic Entomology Laboratory, Beltsville, MD which helps with the identification of potential natural parasites as biological control agents. The overall ARS program is highly coordinated with the 5-year interagency Grasshopper Integrated Pest Management Project begun in 1987 and managed by the Animal and Plant Health Inspection Service. A Grasshopper Integrated Pest Management Project 2-year technology transfer plan has been developed for fiscal years 1994 and 1995; technology developed by the ARS program is an integral part of the plan which includes the Hopper expert system, baits, and the egg parasite and microbial biocontrol agents. The Laboratory is continuing to develop new survey and sampling techniques, forecasting tools, decision aids and biological control agents for integration of pest management options into farm/ranch and crop/range operations.

Mr. DURBIN. By location, what is the funding for grasshopper and Mormon cricket research for fiscal years 1993, 1994, and 1995? [The information follows:]

Location	Fiscal year—		
	1993 funds	1994 funds	1995 funds
Beltsville, MD	\$62,700	\$63,700	\$64,200
Bozeman, MT	618,100	702,600	708,500
Total	680,800	766,300	772,700

GUAYULE

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with guayule, by location.

Dr. FINNEY. Our research on guayule is concerned with both production and end-use of the products produced. At Phoenix, Arizona, Brawley, California, and Weslaco, Texas, we are developing varieties with improved agronomic properties and yield, and cost-effective production management practices. At Phoenix we are also conducting guayule latex and co-product research. The latex research is, in part, a collaborative effort between Phoenix, our Western Regional Research Center at Albany, California and the University of Akron, Akron, Ohio. The Department of Defense, through the Cooperative State Research Service provided \$100,000 in fiscal year 1994 for this research on the extraction and characterization of guayule latex.

Mr. DURBIN. Please describe any recent accomplishments.

Dr. FINNEY. Success in increasing the yield of guayule latex and coproducts through breeding and improved agronomic practices continues. Plant yields are now 200 to 300 percent greater than those obtained from standard USDA lines dating to the 1950s. Perhaps the most interesting and timely new development is the discovery by an ARS scientist that guayule latex, as opposed to normal rubber latex, is non-allergenic. This opens a very important high value market to guayule, particularly at a time when there is clear recognition that the occurrence of "rubber allergy" is not only widespread but appears to be rapidly increasing. A patent has been filed for producing guayule latex suitable for the production of medical quality rubber products and several companies have inquired about licensing. The normal solvent extraction process is not suitable for producing medical quality products.

Mr. DURBIN. By location, what is the funding and staff for guayule research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff devoted to guayule research will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Phoenix, AZ	\$452,300	1.8	\$196,800	1.3	\$198,500	1.3
Brawley, CA	50,300	.....	51,000	.....	.....	.....
Pasadena, CA	156,900	0.6	.....	.....	.....	.....
Albany, CA .....	.....	.....	138,400	0.3	139,600	0.3
Weslaco, TX	173,400	0.5	11,300	.....	11,400	.....
Total	832,900	2.9	397,500	1.6	349,500	1.6

Mr. DURBIN. Is the U.S. military providing any funding for this research?

Dr. FINNEY. There have been no Department of Defense funds contributed to ARS guayule research other than \$100,000 provided in fiscal year 1994 through the Cooperative State Research Service—Critical Materials Program.

HONEY BEE RESEARCH—AFRICANIZED BEES

Mr. DURBIN. Would you please provide for the record a map similar to the one provided last year which shows the advance of the Africanized bee by year?

Dr. FINNEY. We will provide a map that shows South America, Central America, and the Southwestern United States and how the Africanized honey bee has advanced by year.

[The map follows:]

Migration of Africanized Honey Bees



Africanized honey bees have expanded their range northward and southward since 1957. The rate at which they spread is influenced by many factors including weather.

Mr. DURBIN. Would you please describe in detail the research you are doing in connection with Africanized bees?

Dr. FINNEY. ARS supports Department and State action and regulatory programs and the concerns of the beekeeping industry through Africanized honey bee research at four major laboratories. The Bee Research Laboratory at Beltsville, Maryland, develops new techniques for Africanized honey bee identification, genetically characterizes honey bee populations in the New World, and provides authoritative identification services and training for regulatory agencies. At the Honey Bee Breeding, Genetics & Physiology Research Laboratory in Baton Rouge, Louisiana, research emphasis is given to the genetic process of Africanization and to the development of barrier and control technologies. Research at the Honey Bee Research Laboratory, Weslaco, Texas, focuses on the management of European and Africanized honey bees, monitoring changes in feral honey bee populations, the impact of Africanization on pollination of fruit and vegetable crops, and the development of methods for personal protection from Africanized honey bee stinging incidents. At the Carl Hayden Bee Research Center, Tucson, Arizona, scientists are developing new bait hive technologies, are monitoring the process of Africanization in arid environments, and have developed the techniques and are transferring the technology by which rescue workers can intervene in major stinging incidents.

Mr. DURBIN. Please provide for the record the funding assigned to the Africanized bee program by location.

Dr. FINNEY. During fiscal year 1994, funding for Africanized honey bee research at the four honey bee research locations is: Baton Rouge, Louisiana—\$761,500; Tucson, Arizona—\$404,000; Weslaco, Texas—\$390,700; and Beltsville, Maryland—\$252,800. Total funds expended for Africanized honey bee research amount to \$1,809,000, which is 44% of the total honey bee research effort.

WESLACO BEE LABORATORY

Mr. DURBIN. Has the bee lab in Weslaco been completed?

Dr. FINNEY. Yes. The scientists have moved into the new laboratory facility and are productively working. Formal dedication of the laboratory is scheduled for April 7, 1994.

Mr. DURBIN. What research will be carried on there?

Dr. FINNEY. Research will emphasize the management of European and Africanized honey bees, improvement of pollination of fruit and vegetable crops in areas of Africanization, development of methods for personal protection from Africanized honey bee stinging incidents, and development of means for controlling parasitic mites with natural products and synthetic compounds.

Mr. DURBIN. What developments have occurred in the Africanized bee program during the past 12 months?

Dr. FINNEY. During the past 12 months, an Africanized honey bee apiary has been established and management research initiated at Weslaco, Texas. Monitoring of managed and feral honey bee populations has revealed that there are no longer any feral populations of pure European honey bees in the Rio Grande Valley. Technology transfer initiatives have been made that could lead to the commercialization of DEET insect repellent formulations for personal protection during stinging incidents.

HUMAN NUTRITION RESEARCH

Mr. DURBIN. Please list for the record the funding for the human nutrition research centers for fiscal years 1993, 1994, and 1995.
[The information follows:]

Center	Fiscal year—		
	1993	1994	1995
Beltsville Human Nutrition, Research Center, Beltsville, MD	\$9,227,900	\$9,382,800	\$12,972,600
Grand Forks Human Nutrition, Research Center, Grand Forks, ND	8,071,300	8,141,200	8,219,100
Human Nutrition Research, Center on Aging at Tufts University, Boston, MA	14,568,100	14,575,800	14,584,700
Children's Nutrition Research, Center at Baylor, College of Medicine, Houston, TX	10,268,500	10,709,100	10,720,100
Western Human Nutrition, Research Center, San Francisco, CA	5,114,600	5,159,300	5,208,600
Other Locations	2,474,700	2,744,400	2,770,900
Total	49,725,100	50,712,600	54,476,000

Mr. Durbin. Please indicate for the record the funding and staff required for each of those facilities if they were operated at full capacity.

Dr. Finney. The funding and staff required for each of the Nutrition Centers if they were operated at full capacity will be provided for the record.

[The information follows:]

Beltsville Human Nutrition Research Center, Beltsville, Maryland.—The total funding to operate the Center at a full capacity of 50 scientists is \$19.6 million, requiring an increase of \$10.2 million from current base funding.

Reaching full staffing and funding would allow generation of knowledge to better define the role of foods, and food components in prevention of nutritionally related disorders in the biochemically, culturally and aged diverse population. Specific areas of expanded research activity impacted by the increase would include: full staffing of the diet facility for human metabolic studies (\$2.5M); development of standard methods for nutrient composition of foods and reference materials for validation of analysis (\$3.5M); characterization of individual variation in energy balance related to diet (\$1.4M); modeling and systems analysis approaches to study nutrient kinetics (\$2.0M); and interactions of nutrients in foods (\$0.8M). Approximately \$5.5 million of this expanded research will be accomplished through cooperative agreements.

Grand Forks Human Nutrition Research Center, Grand Forks, North Dakota.—The total funding to operate the Center at a full capacity of 24 scientists is \$10.4 million, requiring an increase of \$2.25 million from current base funding.

Full staffing and funding of the Center would allow expansion of knowledge on mineral requirements that will allow greater potential and optimal function throughout the life cycle and provide information for decisions concerning provision of a healthful food supply to the United States population. Specific areas of research impacted by an increase would be: effects of marginal or deficient trace element intake and status in adolescents and Native Americans on physiological and biochemical responses, cognitive functions, chronic diseases and adaptations to environmental factors including airborne oxidants, chemical and ionizing radiation (\$1.25M); and trace element requirements of elderly people and adolescents (especially during the adolescent growth spurt and during cyclic weight loss of the general population), and importance of trace element and magnesium nutriture in bone metabolism (\$1.0M).

Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts.—The total funding to operate the Center at full capacity of 50 ARS and contract scientists at this ARS Government Owned Contractor Operated facility is \$18.0 million, requiring an increase of \$3.4 million from current base funding.

Full funding and staffing of the Center would allow development of information about safe and adequate nutrient intake and identify factors that may contribute to the degenerative processes associated with aging. Specific research areas impacted by an increase will be: interrelationships of diet (including antioxidants exposure), genetics and cell metabolism with immunological and other disorders of aging (\$1.7M); and relationships of diet with maintenance of neurological and cognitive

functions in aging (\$1.7M). All of the expanded research will be accomplished through cooperative agreements.

Children's Nutrition Research Center at Baylor College of Medicine, Houston, Texas.—The total funding to operate the Center at full capacity of 50 ARS and contract scientists at this facility operated under a General Cooperative Agreement is \$16.0 million, requiring an increase of \$5.3 million from current base funding.

Full funding and staffing at the Center would allow expansion of present active programs defining the nutritional needs of infants and young children. Increases in specific research areas include: energy and protein needs on growth, development and body composition of breast fed and formula fed infants (\$1.5M); beneficial effects of human milk in host defense and on gastrointestinal function (\$1.25M); regulation of cholesterol synthesis during lactation (\$1.25M); and dietary factors regulating preborn and infant growth especially in adolescent mothers (\$1.3M). A major portion of this expanded research activity will be performed through cooperative agreements with universities having expertise in these areas. Approximately \$4.5 million of this expanded research will be accomplished through cooperative agreements.

Western Human Nutrition Research Center, San Francisco, California.—The total funding to operate the Center at full capacity of 30 scientists is \$12.0 million, requiring an increase of \$6.8 million from current base funding.

Full staffing and funding would allow expansion of present projects and initiation of studies in new areas directed towards meeting the Center's missions of developing knowledge on nutrient requirements and nutritional assessment methodology. Specific research areas of increased activity impacted by a budget increase would include: improving, evaluating, and implementing the computerized electronic approach to dietary assessment designed for independent use by lay subjects (U.S. Patent pending) (\$1.3M); expansion of support services in areas of body composition, energy, metabolism and dietary assessment (\$1.0M); establishing new research programs on diet and antioxidant metabolism (\$1.0M); metabolism of dietary essential fatty acids in humans (\$1.0M); and expanding present programs in diet and immunology and use of stable isotopes to study vitamin metabolism (\$2.5M). Some of the expanded research activity will be performed through a cooperative agreement with a university, such as the University of California.

HUMAN NUTRITION RESEARCH BY LOCATION

Mr. DURBIN. Please describe for the record the type of research carried out at each of the centers.

[The information follows:]

At the Beltsville Human Nutrition Research Center, Beltsville, Maryland, the role of foods and components in foods in optimizing health and reducing the risk of nutrition related chronic disorders, such as coronary heart disease, cancer and non-insulin dependent diabetes is studied in diverse groups of volunteers. Composition of foods, bioavailability of food nutrients and exploration for new nutrients are ongoing projects to provide nutrient databases. Energy metabolism and energy requirements for weight maintenance, human requirements and metabolic roles for carbohydrates and dietary fibers and mineral and vitamin interactions are major research topics.

At the Grand Forks Human Nutrition Research Center, Grand Forks, North Dakota, scientists study nutritional requirements for zinc, magnesium, boron, copper, and other trace elements and their relationships to optimal health, function, and performance. Physiological and biochemical factors and food sources that influence trace element requirements are studied in all age groups. Biological availability of minerals as affected by other components of the diet is studied using advanced measuring techniques.

At the Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, we examine nutritional requirements of the elderly for optimal health, function, and performance. The relationship of nutrition to the aging process and the role of diet in the prevention of chronic degenerative conditions are studied in volunteers to advanced ages. The role of diet in bone health, prevention of cataracts, immune response, interrelationships of exercise and diet on body composition, and requirements and tolerances of the elderly for folacin, vitamin B-12, vitamin A, vitamin B-6, and vitamin K, and antioxidant nutrients are other topics of research.

At the Children's Nutrition Research Center at Baylor College of Medicine, Houston, Texas, scientists explore nutrient requirements of infants, children, and pregnant, and lactating women. The role of diet for optimum growth and physical and

mental development is the main theme. Specifically, the use of stable nonradioactive isotopes as markers in studies related to energy, protein, fatty acid, carbohydrate, iron, and calcium requirements for growth of young infants and improved lactation in women, and nutritional needs of pregnant teenagers are major current efforts.

The Western Human Nutrition Research Center, San Francisco, California, has the responsibility to develop reliable, efficient, and inexpensive methods for defining nutritional status. This includes effects of marginal nutrient levels on performance and immune function; development of nutritional criteria for evaluation of intervention programs, and human nutritional requirements, including omega-3 fatty acids, vitamin C, folacin, and molybdenum.

HUMAN NUTRITION RESEARCH

Mr. DURBIN. Please describe some of the recent accomplishments.

Dr. FINNEY. The Agricultural Research Service studies the effects of diet on healthy human volunteers of all ages. The objective of this research is to define nutrient requirements for pregnancy, growth and health of children, and nutrient function in the protection from disease of adults and the elderly. Particular emphasis is placed on the needs of infants at risk, protective factors in foods, dietary fat and carbohydrate needs to reduce risk of disease, and vitamin and mineral needs of individuals. Examples of recent progress, also being reflected in ARS's Explanatory Notes material, will be provided for the record.

[The information follows:]

Folate, vitamin B12, and vitamin B6 status are associated with plasma homocysteine in older Americans.—Recent studies have demonstrated associations between some cardiovascular and neuropsychiatric diseases and elevated levels of homocysteine, a non-protein forming amino acid. While some cases of hyperhomocysteinemia may have a genetic basis, some data have indicated this condition may be attributed primarily to nutritional status. Scientists at the USDA Human Nutrition Research Center on Aging at Tufts University examined survivors aged 67–96 years from the original Framingham Heart Study population. They found that one quarter of the people had higher than normal homocysteine levels and two-thirds of those could be attributed to low or marginal status of folate, vitamin B12, and/or vitamin B6. A strong case can now be made for the prevention of the marginal deficiencies of these vitamins, common among older people, as they may be linked to the risk of cardiovascular disease, the leading cause of death in this population.

Low dietary carotene increases oxidative damage.—Eating foods high in carotenes (such as carrots, squash, and tomatoes) is associated with reduced risk of getting certain cancers. Scientists have speculated that carotenes might protect us from cancers by preventing oxidative damage, but the only established role of carotenes in humans is to serve as sources of vitamin A. Scientists at the Western Human Nutrition Research Center at San Francisco, California have completed a study in which a diet low in carotenes (but with adequate vitamin A) was fed to healthy adult women for 10 weeks, then the same diet with added carotenes was fed for 4 weeks. Oxidative damage increased while the women were fed the low carotene diet, then decreased after they were given carotenes. These results suggest that carotenes may form an important part of the antioxidant defense system that protects against oxidative damage, a known risk factor for cancer.

Trans fatty acids no worse than saturated fatty acids in effects on blood lipids.—Processing vegetable oils involves partial hydrogenation, a chemical process that leads to the formation of trans fatty acids that have been suggested to carry a cardiovascular disease risk. In a study at the Beltsville Human Nutrition Research Center, trans fatty acids caused plasma total and LDL-cholesterol ("bad cholesterol") elevations similar to, but no greater than did a diet with equally high levels of saturated fatty acids. At levels of trans intake equal to the average intake in the U.S. diet, there were only minor effects on HDL-cholesterol ("good cholesterol") compared to a highly desirable diet having high levels of naturally occurring unsaturated fatty acids. Thus, partially hydrogenated vegetable oils may continue to be consumed in moderation as part of a healthy, fat controlled diet. Results of this study are important to consumers and to farmers and manufacturers in the oilseed industry who desire to produce healthy foods.

Stearic acid, a component of meat, promotes iron utilization.—Meat contains a factor that promotes iron absorption and utilization in humans. Identification of this factor would be helpful for making recommendations to alleviate iron deficiency, a significant nutritional problem worldwide. Researchers at the Grand Forks Human Nutrition Research Center have obtained evidence that stearic acid, a fatty acid found in meat, especially beef, is such a meat factor. When compared to safflower oil, stearic acid added to the diet of iron-deficient dogs doubled radioiron absorption and significantly increased the movement of iron into the blood and the production of red blood cells. Thus, not only does red meat supply iron, it contains a substance that enhances iron utilization by the body. By including red meat in their diets, people are observing a dietary practice that will prevent iron deficiency.

"Conditionally essential" amino acids in humans.—Traditional classification of amino acids as "essential" and "nonessential" should be reconsidered. Tyrosine, cysteine, glycine, proline, and arginine might be reclassified as "conditionally essential." All five require preformed amino acid skeletons. Using gas chromatography-mass spectrometry scientists at the Children's Nutrition Research Center examined, in fed and fasted humans, the kinetics of plasma lysine, glutamate/glutamine, arginine, and proline following the oral administration of a mixture of uniformly (U)- ^{13}C -labelled protein and carbohydrate. Measurement of the appearance of products in plasma allows the sensitive detection of amino acid biosynthesis. The labelling pattern of arginine and proline suggested synthesis from both intestinal and systemic glutamate. However while arginine synthesis was readily measurable in both fed and fasted states, significant proline synthesis occurred only in fasted subjects. Proline and arginine omnivores are "conditionally essential" and may be nutritionally indispensable for traumatized, burned, or post-surgical patients. Excess arginine is vital in removal of excess ammonium ions. Arginine is the indispensable precursor of creatinine in the kidney. Availability of arginine may affect blood pressure regulation and higher cognitive function.

Improved in vitro method for assessing iron bioavailability.—Iron deficiency anemia is generally considered the most widespread nutritional deficiency in the U.S. This is due, in part, to the fact that only 5 to 10% of dietary iron is bioavailable (available for absorption and utilization). Improving iron bioavailability has been hampered by poor understanding of the factors regulating iron absorption. Scientists at the U.S. Plant, Soil and Nutrition Laboratory in Ithaca, NY have developed a system for estimating bioavailability that involves simulated digestion of a food or a meal followed by measurement of iron uptake by intestinal epithelia cells grown in single-layer cell cultures. This model should prove very useful in improving our understanding of the factors that limit iron bioavailability and it could provide an inexpensive means of screening foods and/or meals for iron bioavailability. Improved knowledge of the factors limiting bioavailability and an inexpensive screening method would contribute to a reduction in the incidence of iron deficiency anemia.

OTHER HUMAN NUTRITION FUNDING

Mr. DURBIN. Does ARS provide any funding for human nutrition research other than for the work at the centers?

Dr. FINNEY. Yes, ARS supports a total of \$2,744,400 of human nutrition research in addition to its five Human Nutrition Research Centers. In fiscal year 1994, this will include \$389,600 at the ARS Soil, Plant and Nutrition Laboratory, Ithaca, New York; \$749,100 at the ARS National Center of Agricultural Utilization Research at Peoria, Illinois; \$834,000 at the ARS Western Regional Research Center, Albany, California; \$721,700 at the ARS Family Economics Research Group, Hyattsville, Maryland; and \$50,000 at headquarters to plan a research initiative in the lower Mississippi delta region.

UNIVERSITY HUMAN NUTRITION RESEARCH

Mr. DURBIN. For the record please describe the major research programs in the field of human nutrition carried out at various universities around the country.

Dr. FINNEY. The major research programs in the field of human nutrition research at the various universities in the U.S. include

those at land-grant institutions as well as medical schools across the country. These include Cornell University, Ithaca, New York; University of California, Davis, California; Iowa State University, Ames, Iowa; University of Illinois, Urbana, Illinois; Pennsylvania State University, University Park, Pennsylvania; University of Florida, Gainesville, Florida; Texas A & M University, College Station, Texas; and the University of Wisconsin, Madison, Wisconsin. Medical schools that have NIH-funded Clinical Nutrition Research Units are University of Chicago, University of California at Davis, University of Washington, Vanderbilt University, University of Alabama at Birmingham, Cornell University at New York City, Harbor-UCLA Medical Center, and Oregon Health Sciences Center. Columbia University has a NIH-funded Obesity Center, a Special Center of Research—SCOR—on arteriosclerosis, and a program on nutrition of low-birth-weight infants. Obesity and Nutrition Research Centers are at the University of Vermont, Burlington, Vermont, New England Medical Center, Boston, Massachusetts, and the University of Pittsburgh, Pittsburgh, Pennsylvania. The University of California at San Diego and at San Francisco, the University of Chicago, and the University of Iowa also have SCOR programs on arteriosclerosis. The University of California at Berkeley has a program on child nutrition and chronic disease; the University of Texas Health Science Center at Dallas has a program of research on lipid metabolism; and Creighton University at Omaha, Nebraska, has a SCOR program on osteoporosis. The Pennington Biomedical Research Center in Baton Rouge, Louisiana, has a nutrition research program associated with the Louisiana State University medical and nutrition programs.

Nutrition research is funded by NIH and CSRS in universities. Annual reports and interagency committees assure sharing of information.

USDA HUMAN NUTRITION RESEARCH

Mr. DURBIN. Please provide a table for the record showing the total USDA program for human nutrition research and education, including the NRI, special grants, Hatch Act, Smith-Lever, and other programs.

[The information follows:]

HUMAN NUTRITION RESEARCH, EDUCATION AND INFORMATION

[Dollars in millions]

	Fiscal year—		
	1993 actual	1994 estimate	1995 budget
HUMAN NUTRITION RESEARCH			
Agricultural Research Service	\$49.7	\$50.7	\$54.5
Cooperative State Research Service	12.7	14.4	12.5
Human Nutrition Information Service	7.3	10.2	17.5
Economic Research Service	1.5	1.5	1.5
Food and Nutrition Service	5.1	4.7	6.4
Total	76.3	81.5	92.4
HUMAN NUTRITION EDUCATION AND INFORMATION			
Extension Service	80.9	82.7	82.7
Human Nutrition Information Service	1.2	0.9	0.9

HUMAN NUTRITION RESEARCH, EDUCATION AND INFORMATION—Continued

(Dollars in millions)

	Fiscal year—		
	1993 actual	1994 estimate	1995 budget
Food and Nutrition Service	148.7	162.3	202.0
Food Safety and Inspection Service	0.1	0.1	0.1
National Agricultural Library	0.7	0.7	0.7
Total	231.6	246.7	286.4
Total, Research, Education and Information	307.9	328.2	378.8

IR-4 RESEARCH

Mr. DURBIN. Please describe for the Committee the IR-4 program and the ARS role under that program.

Dr. FINNEY. The IR-4 program is a cooperative program among Federal, State, and Industry scientists to register minor uses of pesticides. The major research component to develop performance and residue data lies within USDA-ARS, USDA-CSRS, the State agricultural experiment stations, and private industry. A staff headquartered at Rutgers University maintains files, tracks projects, prepares research protocols and develops petitions for submittal to regulatory agencies and the chemical registrants. The program is guided by an Administrative Advisory Committee and a Technical Committee. I represent ARS on the Advisory Committee and one of our scientists is Chairman of the Technical Committee. In addition, the ARS role is to conduct field experiments to determine performance and residue data and to perform the residue analyses.

Mr. DURBIN. How are IR-4 projects selected?

Dr. FINNEY. Minor use needs are identified by growers, researchers and extension specialists. The researchable needs are prioritized at National IR-4 workshops. Annual selection of tentative projects are made at regional meetings by the IR-4 State and ARS liaison representatives. These selections are based in part on the priorities established by workshops and by regional and national needs. Availability of scientific expertise and resources to conduct the studies is also a determining factor in project selection. Final selection of projects is coordinated with the States and ARS and with the field and chemical residue studies at a national meeting each year.

Mr. DURBIN. By location, what is the funding and staff for IR-4 research for fiscal years 1993, 1994, and 1995?

[The information follows:]

IR-4 RESEARCH

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Salinas, CA	\$141,900	1.1	\$141,900	1.1	\$141,900	1.1
Arboretum, DC	31,000	.....	78,800	0.3	78,800	0.3
Tifton, GA	649,400	2.6	649,400	2.6	649,400	2.6
Urbana, IL	10,300	.....	10,300	.....	10,300	.....
Beltsville, MD	343,200	1.6	264,400	1.4	264,400	1.4
Frederick, MD	47,600	0.1	.....	.....	.....	.....

IR-4 RESEARCH—Continued

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Poplarville, MS	11,400	.....	11,400	.....	11,400	.....
Wooster, OH	72,400	1.0	103,400	1.0	103,400	1.0
Corvallis, OR	62,300	0.5	62,300	0.5	62,300	0.5
Charleston, SC	51,800	0.2	51,800	0.2	51,800	0.2
Weslaco, TX	113,400	1.1	113,400	1.1	113,400	1.1
Prosser, WA	90,100	1.2	90,100	1.2	90,100	1.2
Yakima, WA	452,900	2.2	452,900	2.2	452,900	2.2
NPS (To be determined)	64,200	.....	111,800	.....	111,800	.....
Total	2,141,900	11.6	2,141,900	11.6	2,141,900	11.6

Mr. DURBIN. Please provide for the record the total USDA budget for IR-4 for fiscal years 1993, 1994, and 1995, by agency and by program.

[The information follows:]

IR-4 RESEARCH

Agency	1993	1994	1995
ARS	\$2,141,900	\$2,141,900	\$2,141,900
CSRS	3,984,000	7,240,000	11,290,000
Total	6,125,900	9,381,900	13,431,900

JOINTED GOATGRASS

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with jointed goatgrass control research, by location.

Dr. FINNEY. Jointed goatgrass research is conducted by ARS at two locations, Pullman, Washington and Akron, Colorado.

Research at Pullman, Washington, involves herbicide safeners for herbicides otherwise non-selective in wheat, population dynamics and economic thresholds of jointed goatgrass, and biocontrol using soil bacteria.

Research at Akron, Colorado, involves ecological studies of jointed goatgrass and impacts of cultural practices and crop rotations on control and infestation levels.

Scientists from both locations have leadership roles in a regional project on the biology and control of winter annual grasses in dryland winter wheat and have joint research projects with scientists at Washington State University and Colorado State University. Their efforts resulted in a jointed goatgrass symposium held in October 1993 and proceedings issued to the National Association of Wheat Growers. In FY 1993 Congress appropriated \$350,000 to CSRS for a special research grant to Washington State University for jointed goatgrass research. ARS scientists will cooperate on this research.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Jointed goatgrass is a serious pest of winter wheat and, being closely related, no selective herbicides are available for its control. Infestations reduce wheat yields as much as 50 percent and prohibit the production of certified seed because of contamina-

tion by the weed seeds. Since there is no cleaning method to remove 100 percent of the jointed goatgrass seed, it is a threat to U.S. wheat exports. It presently infests over 5 million acres and is spreading at a rate of about 50,000 acres/year. Presently jointed goatgrass is costing growers about \$135 million annually in loss of yields and export markets.

Mr. DURBIN. By location, what is the funding and staff for jointed goat grass control research for fiscal years 1993, 1994, and 1995? [The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Pullman, WA	\$98,700	0.3	\$100,000	0.3	\$100,800	0.3
Akron, CO	30,100	0.1	30,500	0.1	30,800	0.1
Total	128,800	0.4	130,500	0.4	131,600	0.4

JOJOBA

Mr. DURBIN. Please describe for the Committee the research you are doing in connection with jojoba.

Dr. FINNEY. Jojoba is one of the new or alternative crops for which we are developing industrial uses. Markets for the oil portion of the jojoba seed are currently limited to the cosmetic industry because of high cost of the oil. Development of value added uses for the meal byproduct of the oil extraction could reduce jojoba oil cost and expand industrial market opportunities. The National Center for Agricultural Utilization Research—NCAUR—in Peoria, Illinois, has been developing processes and products for the 50 percent of the seed left after oil extraction. Elimination of a natural toxin, development of methods of analysis, and cost effective processes for separation and recovery of the meal constituents are the primary objectives.

Mr. DURBIN. Please describe your accomplishments in this field of research.

Dr. FINNEY. The process developed at NCAUR produces a unique protein whose performance properties when used in shampoos surpass those of materials currently used. This same process produces two other products, a nutritional feed binder to replace the non-nutritional feed binder currently used in pelleted feeds and a natural appetite suppressant that regulates weight gain in poultry to produce desired growth rates. Additionally, the process permits full recovery of the residual jojoba oil left in the meal after extraction. Transfer of this technology to both feed and health care industries is underway.

Mr. DURBIN. What is the budget for this project for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The budget for jojoba research for fiscal years 1993, 1994, and 1995 is \$143,600; \$148,200; and \$149,400 respectively.

KENAF

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with kenaf, by location.

Dr. FINNEY. We have research underway at five locations. At Lane, Oklahoma; College Station, Texas; and Weslaco, Texas; we

are conducting variety improvement and agronomic research to devise production systems appropriate to the area. At Stoneville, Mississippi, we are also conducting kenaf research in cooperation with Mississippi State University at Starkville, Mississippi. The scope of the research ranges from agronomic investigations to the development of mechanical harvesting and processing methods for preparation of textile fiber materials and other products. At New Orleans, Louisiana, we are researching the use of kenaf fibers in textiles and non-wovens. In addition, product and processing development studies are carried out in close coordination with the four businesses processing kenaf and the Fiber Cooperative of Tallahatchie County, Mississippi. Other cooperative research is underway with the Forest Products Laboratory of the Forest Service in the development of kenaf products for use in automotive and packaging industries, and with Louisiana State University, Baton Rouge, Louisiana, to devise environmentally acceptable ways of making high-grade textile fiber.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. In cooperation with local industries we developed agronomic systems adapted to local cultural and environmental conditions for growing kenaf in South Texas, Mississippi and Louisiana. We developed a nematode-tolerant variety of kenaf and demonstrated its use in several growing areas. Also, in the last four years, we developed or helped develop, uses of kenaf as oil-spill control material, poultry litter, horticultural growth medium, material for resin-reinforced fiber board and insulation board for the building trade, and we demonstrated its advantages as forage for cattle. We also demonstrated kenaf's potential as an economical fiber source for non-wovens and other possible textile applications.

Mr. DURBIN. Originally, this research was promoted as a means to develop a new product that would be used to replace imported newsprint. To what extent has this occurred?

Dr. FINNEY. Indeed, the technology for use of kenaf as a fiber source for paper was developed in the 1970's, and large-scale demonstrations of newsprint production were successfully carried out in the early 1980s. Plans were developed by private companies first, to build a 600,000 ton plant, with a \$400 million investment. This was later scaled back to 40,000 tons, at a cost of \$35 million. In the meantime, a declining market for newsprint, because of the sharp increase in recycling, and an unfavorable investment climate beginning three years ago caused an indefinite postponement.

Mr. DURBIN. By location, what is the funding and staff for kenaf research for fiscal years 1993, 1994, and 1995?

[The information follows:

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Headquarters	\$328,900	.....	\$372,200	.....	\$372,200	.....
New Orleans, LA	43,300	0.2	126,900	0.5	128,000	0.5
Stoneville, MS	393,400	.....	393,300	.....	396,600	.....
Lane, OK	151,400	1.0	153,100	1.0	154,400	1.0
College Station, TX	48,900	0.3	38,300	0.3	38,600	0.3
Phoenix, AZ	22,300	0.1	.....	.....	.....	.....

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Weslaco, TX	344,800	1.5	360,700	1.5	363,700	1.5
Total	1,333,000	3.1	1,444,500	3.3	1,453,500	3.3

LOCOWEED RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with locoweed research, by location.

Dr. FINNEY. ARS research on locoweed is conducted at Logan, Utah. Laboratory studies are determining the amount and duration of locoweed ingestion by livestock necessary to cause reproductive dysfunction, and evaluating the metabolic fate of the locoweed toxin, swainsonine, in animal tissues and the residues that may result. In sheep, ARS is evaluating the effect of locoweed poisoning on sheep and lamb behavior, and the progression and dose relationship of lesions. Grazing studies evaluate the effect of various environmental and pasture conditions on locoweed poisoning of cattle and sheep, and the relationship between the grazing experience of livestock and locoweed consumption. Management strategies to minimize locoweed poisoning and the potential for control with herbicides, or with plant pathogens or native insect biocontrol agents are being studied through a cooperative agreement from the Logan laboratory with New Mexico State University.

Mr. DURBIN. Please describe the need for this research.

Dr. FINNEY. Locoweed grows in all western States and is a serious problem in Utah, Arizona, New Mexico, Texas, Colorado, Wyoming, and Montana. The primary effects of locoweed on livestock include emaciation, neurological disturbances, abortions, birth defects, congestive right heart failure, decreased growth rate, decreased fertility, and loss of libido. If grazed extensively, animals may die and animals that survive are often useless for breeding or food.

Mr. DURBIN. By location, what is the funding and staff for locoweed research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding for locoweed research at Logan, Utah, was \$516,400 in FY 1993. For FY 1994 and 1995, funding is projected to be \$524,900 and \$529,300 with two ARS scientists working on locoweed research. This includes \$114,000 in support of a cooperative agreement with New Mexico State University.

LOW-INPUT SUSTAINABLE AGRICULTURE

Mr. DURBIN. Would you please describe for the Committee in detail the work ARS has underway in the field of low-input sustainable agriculture?

Dr. FINNEY. ARS research on sustainable agriculture encompasses approximately 370 projects or about 25 percent of our programs. All of these projects are considered to contribute substantially to sustainable agriculture research. Projects considered as contributing substantially to sustainable agriculture relate to two or more of the following criteria: integrated system of plant and, animal production practices, satisfies human food and fiber needs enhances environmental quality, natural resource conservation and

enhancement, biological resource utilization, economic viability, and quality of life. Specific examples of ARS research related to sustainable agriculture in fiscal year 1994 will be provided for the record.

[The information follows:]

Development of economically efficient and sustainable forage and livestock production systems for hill-land small farms (Booneville, Arkansas),

Development and assessment of agroforestry systems for family farms that are compatible with combined livestock, tree, pasture, and wildlife production (Booneville, Arkansas),

Development and evaluation of management systems, involving grass strips and hedges and reduced tillage designed to improve water use efficiency, erosion control, soil and water quality, and crop production (Oxford, Mississippi),

Determination of the effects of conservation tillage and no-tillage on weed, insects, diseases, crop yields, and soil quality in a 3-year cereal legume rotation (Pullman, Washington),

Evaluation of insect pathogens and arthropods attacking selected insect and weed pests of solanaceous vegetables, cole crops, and sweet corn in the Mid-Atlantic region (Beltsville, Maryland),

Evaluation of modern cultural practices (including conservation tillage, soil mulches, and plant covers) on the productivity and quality of vegetable cultivars (Beltsville, Maryland).

Mr. DURBIN. Where is this work carried out?

Dr. FINNEY. ARS research on sustainable agriculture is presently being conducted at over 90 of ARS's laboratories, located in 42 States.

Mr. DURBIN. What is the budget for fiscal years 1993, and 1994, and 1995?

Dr. FINNEY. During 1993 we developed and began using new criteria recently established by USDA for sustainable agriculture research, as defined in the 1990 Farm Bill. We convened panels to reassess the contribution of individual research projects to sustainability. These panels included university scientists, representatives from industry, farmers, representatives from non-profit organizations, as well as USDA scientists. They concluded that ARS research contributing to low input sustainable agriculture was budgeted for 1993, 1994, and 1995 at \$165,647,000, \$169,643,000 and \$169,599,000 respectively.

Mr. DURBIN. What is the total USDA program, by agency, for low-input sustainable agriculture for fiscal years 1993, 1994, and 1995.

Dr. FINNEY. The total USDA funding for low-input sustainable agriculture by agency and fiscal year will be provided for the record.

[The information follows:]

SUSTAINABLE AGRICULTURE

	Fiscal year—		
	1993 actual	1994 estimated	1995 estimated
Agricultural Research Service	\$165,647,000	\$169,643,000	169,599,000
Cooperative State Research Service	90,061,000	95,257,000	95,199,000
Extension Service	23,200,000	26,422,000	30,422,000
National Agriculture Library	57,000	41,000	41,000
Total	278,965,000	291,363,000	295,261,000

LYME DISEASE RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with Lyme disease research, by location.

Dr. FINNEY. Lyme disease research in ARS is conducted at two cooperating laboratories. The Livestock Insects Laboratory at Beltsville, Maryland, conducts research on the ecology of adult deer ticks at the woods/pasture interface. Included in this effort is research on tick response to the glandular secretions from white-tailed deer. Research also addresses the movement of deer ticks as it relates to protecting premises from the risk of exposure and includes the development of physical/chemical barrier technology. At the Knipling-Bushland U.S. Livestock Insects Laboratory, Kerrville, Texas, emphasis is given to the characterization of host/parasite interactions with particular attention to wildlife. Research is also underway to develop chemical control technologies, including novel delivery systems for controlling adult ticks on white-tailed deer, and their utilization within integrated management systems. In fiscal year 1995, research on the control of tick vectors of Lyme disease will be terminated at Beltsville, Maryland, along with the cooperative activities of the New York Medical College at Valhalla, New York. Research at Kerrville, Texas, will continue to emphasize the development of novel delivery systems for and formulations of systemic insecticides that will effectively control adult ticks on white-tailed deer.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Since the deer tick is the principal vector of Lyme disease, research is necessary to devise methods of reducing the tick's population density in order to break the disease transmission cycle.

Mr. DURBIN. What are some of the Agency's accomplishments in this field of research?

Dr. FINNEY. ARS scientists have developed fundamental information on the biology and host interactions of deer ticks in urban and semi-rural environments. With this knowledge, a computer model of tick population dynamics and Lyme disease transmission has been constructed that will assist in developing environmentally sensitive strategies for deer tick management. In addition, methods of treating white-tailed deer to control adult deer ticks with medicated bait and insecticidal self treatment devices have been developed and are being evaluated in the field.

Mr. DURBIN. By location, what is the funding and staff for Lyme disease research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Beltsville, MD	¹ \$406,700	1.0	¹ \$708,800	2.0	.....	.....
Kerrville, TX	230,200	1.0	233,500	1.0	\$235,400	1.0
Total	636,900	2.0	942,300	3.0	235,400	1.0

¹Includes \$175,000 cooperative agreement with the New York Medical College.

METHYL BROMIDE RESEARCH

Mr. DURBIN: Please describe for the Committee the work you are doing in connection with methyl bromide research by location.

Dr. FINNEY: ARS is conducting research at 18 locations to find alternatives to present soil and postharvest uses of methyl bromide. A description of our research projects at these locations will be provided for the record.

[The information follows:]

Research to develop alternatives to methyl bromide treatments for commodity exports produced in the western United States is conducted at ARS laboratories in Fresno, CA and Yakima, WA. Commodities being studied include nectarines, cherries, apples, raisins and other dried fruits, citrus, tree nuts, cotton, and hay. Many of these commodities can not currently be exported without methyl bromide treatment for quarantine pests. Research approaches include alternative fumigants, heat and cold, modified atmospheres and combinations of treatments.

At Weslaco, TX, Gainesville, FL, and Orlando, FL, we are developing alternative quarantine treatments for citrus and subtropical fruits such as mangoes as well as studying ways to minimize phytotoxic effects of these treatments. Emphasis is placed on pest-free zones, and heat and cold treatments.

At our Honolulu, HI, laboratory we are developing alternatives for tropical fruit infested with fruit flies, especially Mediterranean and oriental fruit flies, to allow export of Hawaii-grown fruit to foreign markets as well as mainland United States and protect mainland United States from introduction of pests present in Hawaii. This research focuses on heat and cold commodity treatments and on techniques to eradicate the fruit flies.

We are developing methyl bromide alternatives for grain, milled products, mills and grain storage facilities at our Manhattan, KS, laboratory. Alternative fumigants, modified atmospheres, heat and combinations of these treatments are being investigated.

Research to develop alternatives to methyl bromide treatments for soil insects, pathogens, and weed seeds is conducted at 11 ARS laboratories. At Beltsville, MD; Charleston, SC; Orlando, FL; and Salinas, CA, the research is focused on development of integrated management of soilborne pests of vegetables based on host resistance, cultural practices, and existing alternative chemicals.

At Corvallis, OR and Washington, DC, biological control methods to manage soilborne pests of ornamental and nursery crops are being developed. In addition, beneficial microorganisms are being developed to improve plant health.

At Byron, GA; Kearneysville, WV; and Wenatchee, WA, biologically-based management of soilborne pests on deciduous fruit trees is being developed based on biological control and cultural practices.

At Stoneville, MS, and Tifton, GA, existing alternative chemicals are being evaluated and improved pesticide application technology is being developed to control soilborne pests.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Methyl bromide is a halogenated hydrocarbon used as a soil fumigant to control insects, weeds, and soil pathogens affecting production of vegetables and other crops and as a postharvest fumigant for pest disinfestation of fruits for export and import. The Environmental Protection Agency has banned the use of methyl bromide, effective in the year 2001 because of its ozone depletion potential. Loss of methyl bromide as a postharvest commodity and soil fumigant will adversely affect crop production in the United States and both export and import trade between the U.S. and its trading partners. The development of alternative technologies to the use of methyl bromide is one of USDA's highest research priorities.

Mr. DURBIN. What are some of the agency's accomplishments in this field of research?

Dr. FINNEY. Methyl bromide was only recently identified as an ozone depleting material and intensive research to find alternatives

have only recently gotten underway. However, because ARS has for many years been developing non-chemical procedures to replace chemical soil and postharvest fumigations, ARS has several accomplishments in this area.

Postharvest treatments ARS developed or assisted in developing include cold treatment for citrus and carambola from Florida to Japan; pest-free status for walnuts to New Zealand; heat treatments for papaya and cold treatment for carambola from Hawaii to Japan and mainland U.S.; and phosphine fumigation of hay to Japan.

Accomplishments pertinent to replacing methyl bromide as a soil treatment include improved strawberry and vegetable varieties with increased resistance to some soilborne diseases and pests; microbiological agents for the biological control of some soilborne diseases of vegetables and ornamental crops; improved cultural practices, such as improved soil preparation, crop rotation systems, and altered planting dates, to mitigate the effects of some soilborne pests of strawberries, vegetables and ornamental crops; and improved pesticide formulation and application technology for available chemicals other than methyl bromide to control plant parasitic nematodes.

Mr. DURBIN. By location, what is the funding and staff for methyl bromide research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. A table showing methyl bromide alternatives research funding and staffing by location for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Locations	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Fresno, CA	\$889,900	3.3	\$1,199,400	4.3	\$4,024,900	10.3
Salinas, CA					300,000	1.0
Washington, DC	93,500	0.5	94,900	0.5	95,700	0.5
Gainesville, FL					1,040,900	4.0
Miami, FL	1,242,900	7.0	1,264,300	7.0		
Orlando, FL	570,300	2.1	826,600	3.1	2,163,500	8.1
Byron, GA	85,600	0.4	86,900	0.4	87,600	0.4
Savannah, GA	171,400	0.3	173,800	0.3		
Tifton, GA					484,800	2.0
Honolulu, HI	1,631,000	2.8	1,647,900	2.8	1,661,800	2.8
Manhattan, KS					250,000	1.0
Beltsville, MD	631,000	2.4	740,400	2.4	2,358,900	6.0
Stoneville, MS	188,000	0.8	190,200	0.8	191,800	0.8
Corvallis, OR	44,500	0.2	45,000	0.2	975,100	3.2
Charleston, SC	319,600	1.5	323,600	1.5	826,300	3.5
Weslaco, TX	1,267,500	3.9	1,536,600	4.9	2,126,500	6.9
Wenatchee, WA					185,200	1.0
Yakima, WA	263,500	0.8	267,600	0.8	1,111,400	3.8
Kearneysville, WV					456,100	1.0
Other Locations	56,400	0.3	57,000	0.3	225,800	1.3
Total	7,455,100	26.3	8,453,600	29.3	18,566,300	57.6

MUSHROOM RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with mushroom research, by location.

Dr. FINNEY. ARS conducts a limited amount of research on mushrooms at the Eastern Regional Research Center in Philadel-

phia. This research is part of a comprehensive research program concerned with controlling physiological breakdown in minimally processed—fresh-cut—fruits and vegetables, including mushrooms. The research is specifically focused on determining the causes and control of mushroom defects, including browning. In addition, research is also conducted on postharvest treatments to reduce microbial contamination. The overall purpose of this research is to improve the quality, enhance the shelf life, and ensure the safety of mushrooms.

Mr. DURBIN. By location, what is the funding and staff for mushroom research for fiscal years 1993, 1994, and 1995.

Dr. FINNEY. Funding for mushroom research at Albany, California, in fiscal year 1993 was \$103,000. For fiscal years 1994 and 1995, estimated funding at Philadelphia, Pennsylvania is \$58,300 and \$58,800, respectively. We estimate that 0.25 of a scientist year is related to mushroom research.

MYCOPLASMA

Mr. DURBIN. Please describe for the Committee the work you have underway in *Mycoplasma*.

Dr. FINNEY. ARS is currently conducting *Mycoplasma* research at the South Central Poultry Research Unit, Mississippi State, Mississippi. The objectives of the research are to develop rapid diagnostic tests for mycoplasmosis in poultry and to develop methods to reduce poultry losses from *Mycoplasma* infections.

Mr. DURBIN. Please describe why this research is needed.

Dr. FINNEY. *Mycoplasma* infections produce respiratory and air sac diseases and joint diseases in chickens, turkeys, and other poultry. Substantial economic losses to the poultry industry result from morbidity in birds, reduced production efficiency, and carcass condemnation at slaughter. Annual losses are estimated at \$140 million in laying flocks.

Mr. DURBIN. By location, what is the funding and staff for *Mycoplasma* research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staffing for *Mycoplasma* research for fiscal year 1993 was \$343,500 and approximately one and one-half scientist year. For fiscal years 1994 and 1995, estimated funding is \$388,400 and \$391,400, respectively, with one and one-quarter of scientific staff time in each year. The *Mycoplasma* program is located entirely at Mississippi State, Mississippi.

NARCOTICS CONTROL RESEARCH

Mr. DURBIN. Please describe the work you have underway on narcotics control research.

Dr. FINNEY. ARS narcotics research primarily supports federal drug control and policy agencies. These include the White House Office of National Drug Control Policy, the Department of State, the National Institutes of Health, the Central Intelligence Agency, the Drug Enforcement Administration and the U.S. Forest Service. Our primary programs involve narcotic crop eradication research involving herbicides, narcotic crop yield estimates, illicit crop remote sensing, narcotic chemistry and plant physiology, and substance abuse and alcoholism in rural areas of the U.S. During the last year we have initiated successful programs to estimate illicit

opium production in Southeast Asia, coca leaf yield in Bolivia, and have assisted the Department of State in a coca crop eradication program in Panama. Additionally, we have developed a system of research with the National Institutes of Health to measure drug, alcohol and Acquired Immune Deficiency Syndrome—AIDS—prevalence in rural America.

Mr. DURBIN. What funding do you receive from other agencies.

Dr. FINNEY. The ARS budget for this research amounts to \$6,489,000. In addition to the budgeted amount of \$6,489,000 in FY 1994, ARS has received \$150,000 in assistance from the Central Intelligence Agency for developing opium crop estimates in Southeast Asia. It is anticipated that an additional \$350,000 will be received from the White House Office of National Drug Control Policy—ONDCP—for developing coca crop estimates in South America.

Mr. DURBIN. By location, what is the funding and staff for narcotics research in fiscal years 1993, 1994, 1995.

Dr. FINNEY. The funding and staffing for narcotics research in fiscal years 1993, 1994, and 1995 will be provided for the record. [The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Beltsville, MD	\$5,527,000	10.5	\$5,754,000	12.0	\$5,755,000	12.0
New Orleans, LA	200,000	0.5	100,000	0.5	100,000	0.5
Stoneville, MS	460,000	3.0	75,000	0.5	75,000	0.5
College Sta., TX	300,000	2.0	310,000	2.0	310,000	2.0
Weslaco, TX	--	--	250,000	1.0	250,000	1.0
Total	6,487,000	16.0	6,489,000	16.0	6,490,000	16.0

NATIONAL ARBORETUM

Mr. DURBIN. Please provide for the record the budget for the National Arboretum for fiscal years 1993, 1994, and 1995.

Dr. FINNEY. Funding for the National Arboretum for fiscal year 1993 was \$4,292,800. For fiscal years 1994 and 1995, anticipated funding is \$6,505,600 and \$6,546,900 respectively.

NORTHWEST SMALL FRUIT RESEARCH CENTER

Mr. DURBIN. Please describe the work you are funding at the Northwest Small Fruit Research Center in Corvallis, Oregon.

Dr. FINNEY. ARS research at the Northwest Small Fruit Research Center in Corvallis, Oregon, is directed toward development of virus-resistant and virus-free small fruit, and development of beneficial microorganisms to enhance plant health, growth, and yield. Through specific cooperative agreements, ARS supports extramural research on small fruits evaluation, virus indexing, biological control of diseases of small fruits, and non-chemical pest control of insects through host resistance and microbial pesticides.

Mr. DURBIN. What is the funding and staff for research at this Center for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding for research at this Center for fiscal years 1993, 1994, and 1995 is \$710,700, \$965,100, and \$973,200 respectively. The estimated SY's for each year is 2.4.

OATS RESEARCH

Mr. DURBIN. Please describe the work you have underway on oats research.

Dr. FINNEY. For fiscal year 1994, we have research on oats at 15 locations. The objectives of this research by location will be provided for the record.

[The information follows:]

- Aberdeen, ID—Preservation, evaluation, and enhancement of germplasm.
- Albany, CA—Determine molecular basis of gene expression and improve nutritional properties.
- Ames, IA—Genetics of host resistance to crown rust.
- Brookings, SD—Barley yellow dwarf virus vector epidemiology.
- E. Lansing, MI—Winter hardiness.
- Fargo, ND—Improving physical and chemical properties of oat bran.
- Griffin, GA—Reducing rust losses.
- Ithaca, NY—Virus-vector interactions relating to transmission of barley yellow dwarf virus.
- Madison, WI—Physiological, biochemical, and molecular regulation of quality.
- Montpellier, France—Identification of natural enemies of the Russian wheat aphid.
- Raleigh, NC—Resistance to fungal pathogens.
- St. Paul, MN—Resistance to rust fungi.
- University Park, PA—Increasing winter hardiness.
- Urbana, IL—Mechanisms of resistance to cereal viruses.
- W. Lafayette, IN—Host-virus interactions relating to resistance to barley yellow dwarf virus.

Mr. DURBIN. By location, what is the funding and staff for oats research for fiscal years 1993, 1994, and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Aberdeen, ID	\$618,300	2.0	\$562,700	2.0	\$567,400	2.0
Albany, CA	153,500	0.6	182,700	0.6	184,200	0.6
Ames, IA	165,900	0.9	167,600	0.9	169,000	0.9
Brookings, SD	36,100	0.2	40,700	0.2	41,000	0.2
E. Lansing, MI	15,000	0.1	5,600	0.1	5,600	0.1
Fargo, ND	205,500	1.0	209,000	1.0	210,700	1.0
Griffin, GA	30,500	0.2	30,800	0.2	31,100	0.2
Ithaca, NY	17,100	0.1	120,300	0.1	121,300	0.1
Madison, WI	268,900	1.4	270,700	1.4	273,000	1.4
Montpellier, FR	91,200	0.3	92,100	0.3	92,900	0.3
Raleigh, NC	27,100	0.1	27,600	0.1	27,800	0.1
St. Paul, MN	414,900	2.3	592,400	2.3	597,400	2.3
Univ. Park, PA	184,800	1.0	188,200	1.0	189,800	1.0
Urbana, IL	81,100	0.5	82,200	0.5	82,900	0.5
W. Lafayette, IN	182,100	0.7	183,400	0.7	184,900	0.7
Total	2,492,000	11.8	2,756,000	11.4	2,779,000	11.4

PEACH RESEARCH

Mr. DURBIN. Please describe for the record the work you have underway on peach research.

[The information follows:]

ARS headquarters—Funding for peach germplasm at the National Clonal Germplasm Repositories.

Albany, CA—Methods for detecting pesticide residues, control of toxic microbial metabolites, value-added products, and fruit processing.

Athens, GA—Flavor and texture assessment, postharvest quality, and non-destructive measurements of fruit maturity.

Beltsville, MD—Detection, identification, and control of viruses and viroids; in vitro culture of endomycorrhizae; gene transfer and tissue culture technologies; internal mechanisms of resistance to postharvest decay; and maintenance of quarantine facilities.

Booneville, AR—Production systems for small farms.

Byron, GA—Biologically-based management of soilborne pathogens including nematodes, identification of low soil pH tolerant rootstocks, development of improved pest-resistant varieties, and insect control.

Davis, CA—Management of fungal, viral, and mycoplasma like diseases; and germplasm maintenance.

Frederick, MD—Development of improved detection and identification of virus and virus-like agents in quarantine germplasm.

Fresno, CA—Biocontrol of insects, control of postharvest diseases, germplasm evaluation and enhancement, and variety development.

Honolulu, HI—Development of semichemicals to control insects.

Kearneysville, WV—Breeding and variety development, peach fruit development and ripening, adaptation to biological and environmental stress, management of insect and disease pests, crop production using aquaculture effluent, mechanical harvesting, cultural practices, weed control, and postharvest quality.

Peoria, IL—Identification, evaluation, and development of natural products to control fruit flies.

Philadelphia, PA—Research on carbohydrate-based biopolymers.

Wenatchee, WA—Control of virus diseases.

Yakima, WA—Control of green peach aphid and other peach insects.

Mr. DURBIN. By location, what is the funding and staff for peach research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. Funding and staff for peach research for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA	\$127,400	0.9	\$142,300	0.9	\$190,800	0.9
Athens, GA	337,600	2.0	69,500	0.3	65,800	0.3
Beltsville, MD	622,900	2.8	537,700	2.8	542,200	2.8
Booneville, AR	22,800	0.2	23,000	0.2	23,200	0.2
Byron, GA	612,200	4.2	622,700	4.2	627,900	2.0
Davis, CA	171,400	0.6	194,100	0.6	195,700	0.6
Frederick, MD .....	.....	.....	83,100	0.1	83,800	0.1
Fresno, CA	253,200	1.1	307,800	1.1	349,000	1.1
Honolulu, HI	44,400	0.1	44,900	0.1	45,200	0.1
Kearneysville, WV	1,670,300	7.7	1,805,100	7.7	1,820,200	7.7
Peoria, IL	47,800	0.2	48,500	0.2	48,900	0.2
Philadelphia, PA	59,600	0.3	.....	.....	.....	.....
Wenatchee, WA	50,800	0.6	42,800	0.6	43,200	0.6
Yakima, WA	71,800	0.6	94,000	0.6	94,800	0.6
Headquarters	6,400	0.1	11,200	0.1	11,200	0.1
Total	4,098,600	21.4	4,026,700	19.5	4,141,900	17.3

PEANUT RESEARCH

Mr. DURBIN. Please describe the work you have underway on peanut research.

Dr. FINNEY. We have research on peanuts at 12 locations. The objectives of this research by location will be provided for the record.

[The information follows:]

Athens, GA—Methods to measure product composition and quality.

Beltsville, MD—Response mechanisms to drought and mineral stress and research on aflatoxin and other food safety problems.

Dawson, GA—Development of new production systems.

Gainesville, FL—Bioregulation of stored product insects.

Griffin, GA—Maintenance, evaluation, and distribution of germplasm.

Mayaguez, PR—Germplasm development and seed increase.

New Orleans, LA—Genetic regulation of aflatoxin biosynthesis.

Raleigh, NC—Development of quality and flavor components.

Savannah, GA—Control of stored product insects.

Stillwater, OK—Evaluation of peanut germplasm.

Suffolk, VA—Improved germplasm to maximize production efficiency.

Tifton, GA—Improved management practices and improved peanut germplasm resistance to diseases, insects, and nematodes.

Mr. DURBIN. By location, what is the funding and staffing for peanut research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff for peanut research for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Athens, GA	\$33,600	0.5	\$43,100	0.5	\$45,500	0.2
Beltsville, MD	130,100	0.4	132,300	0.4	133,400	0.7
Dawson, GA	2,328,700	10.0	2,320,700	10.0	2,340,100	10.0
Gainesville, FL	91,400	1.0	113,900	1.0	255,700	1.2
Griffin, GA	367,100	1.2	371,400	1.2	374,500	1.1
Mayaguez, PR	120,800	0.5	122,300	0.5	123,300	0.5
New Orleans, LA	687,300	3.0	591,500	3.0	596,500	3.4
Raleigh, NC	762,900	4.0	776,000	4.0	782,500	4.0
Savannah, GA ¹	388,100	2.0	394,900	2.0	.....	.....
Stillwater, OK	273,300	1.0	276,000	1.0	278,300	1.0
Suffolk, VA	730,500	3.0	740,600	3.0	.....	.....
Tifton, GA	1,111,800	3.0	1,137,800	3.0	1,147,300	3.0
Headquarters	345,600	.....	345,600	.....	345,600	.....
Total:	7,371,200	29.6	7,366,100	29.6	6,422,700	25.1

¹ \$139,700 will be redirected from Savannah to Gainesville in FY 1995 for peanut research.

PEAR THRIPS

Mr. DURBIN. Please describe the work you have underway on pear thrips.

Dr. FINNEY. ARS has provided insect pathology support and established a cooperative agreement with the University of Vermont for research on the control of pear thrips. The ARS European Biological Control Laboratory at Montpellier, France will provide logistical and laboratory support for a University of Vermont exploration team to Eurasia to locate biological controls for pear thrips.

Mr. DURBIN. By location, what is the funding and staff for pear thrips research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding at Ithaca, New York, for pear thrips in fiscal year 1993 is \$79,000. The estimated funding for fiscal years 1994 and 1995 is \$82,600 and \$83,300, respectively. The scientist years are 0.3 for each year.

PEAS, LENTILS, AND LEGUMES

Mr. DURBIN. Please describe the work you have underway on peas, lentils, and legumes.

Dr. FINNEY. ARS conducts research on peas, lentils, and legumes at nine locations. The objectives of this research by location will be provided for the record.

[The information follows:]

Albany, CA—Development of assays for pesticide residues on fresh peas, and genetic engineering of ethylene responses.

Athens, GA—Isolation and characterization of genes associated with flower development.

Beltsville, MD—Elucidation of the photosynthesis process in fresh peas.

Charleston, SC—Development of legumes with increased resistance to nematodes and other soilborne pathogens; determination of alleopathic factors affecting weed control.

Corvallis, OR—Characterization of viruses infecting legumes.

Geneva, NY—Maintenance and evaluation of pea genetic stocks now transferred to Pullman, WA.

Griffin, GA—Detection and elimination of viruses in legume germplasm; detection of resistance to viruses in legume germplasm.

Pendleton, OR—Soil nutrition, control of erosion, and management in dryland pea production and quantification of plant responses to environmental stress factors.

Prosser, WA—Evaluation and enhancement of pea germplasm, identification of disease resistance, and computer modeling of conservation tillage-based production systems.

Pullman, WA—Identification of insect and disease resistance in dry peas and lentils; establishment of genetic linkage maps in lentils, dry peas, and chickpeas; development improved varieties; and development of integrated pest management systems. Maintenance of pea germplasm and pea genetic stocks.

Mr. DURBIN. By location, what is the funding and staff for peas, lentils, and legumes research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff for peas, lentils, and legumes research for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA	\$145,300	1.2	\$173,600	1.2	\$175,000	1.2
Athens, GA	19,200	0.1	19,500	0.1	.....	.....
Beltsville, MD	160,800	0.7	163,400	0.7	164,800	0.7
Charleston, SC	310,100	1.6	314,400	1.6	317,000	1.6
Corvallis, OR	160,300	0.8	162,300	0.8	163,700	0.8
Geneva, NY	66,900	0.3	67,200	0.3	67,800	0.3
Griffin, GA	226,500	0.6	202,400	0.6	204,100	0.6
Prosser, WA	233,400	1.2	236,000	1.2	238,000	1.2
Pullman, WA	707,500	3.3	716,300	3.3	722,300	3.3
Headquarters	65,100	.....	65,100	.....	65,100	.....
Total	2,095,100	9.8	2,120,200	9.8	2,117,800	9.7

PECAN RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with pecan research, by location.

Dr. FINNEY. A description of the ARS pecan research program by location will be provided for the record.

[The information follows:]

Athens, GA—Identification and development of natural products to enhance crop production efficiency of pecans.

Brownwood, TX—Collection, identification, preservation, evaluation, and distribution of clonal pecan germplasm; pecan genetics; and development of improved pecan cultivars.

Byron, GA—Germplasm enhancement; and development of improved pecan cultivation and pest (disease and insect) management strategies.

Stoneville, MS—Development of biological and other non-insecticidal methods to manage insect pests of pecan.

Mr. DURBIN. By location, what is the funding and staff for fiscal years 1993, 1994 and 1995?

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Athens, GA	\$190,700	5.4	\$193,300	5.4	\$194,900	5.4
Byron, GA	986,200	3.2	1,002,000	5.4	1,010,400	5.4
Brownwood, TX	601,000	1.8	609,500	1.8	.....	.....
College Sta., TX .....	.....	.....	.....	.....	84,000	.....
Stoneville, MS	134,100	1.0	135,800	1.0	136,900	1.0
Total	1,912,000	11.4	1,940,600	13.6	1,426,200	11.8

PLANT GENE EXPRESSION CENTER

Mr. DURBIN. Please describe for the Committee some of the accomplishments of the Plant Gene Expression Center during the past 12 months.

Dr. FINNEY. Some of the more recent accomplishments of the Plant Gene Expression Center (PGEN) at Albany, California will be provided for the record.

[The information follows:]

Bioremediation—Plants and certain fungi make a kind of peptide that binds toxic metals such as cadmium. The bound metal is then sequestered into vacuoles to prevent metal toxicity of cytoplasmic targets. Two years ago, the gene coding for the transport protein was cloned by scientists at the PGEN. They have now shown by biochemical means that it transports the peptide-metal complex across the vacuolar membrane. Making more of this transport protein in yeast enhances cadmium tolerance and vacuolar accumulation of the metal. Manipulating the production level of this protein in plants may be a possibility to alter metal storage capacity. Enhanced uptake may be useful for bioremediation of contaminated soils, or restricted uptake may prevent metal entry into edible plant parts.

Precise DNA transfer and insertion—Current methods in gene transfer result in random insertions of DNA into plant chromosomes. This random integration process is often associated with the insertion of multiple copies and unpredictable rearrangements of the original molecule. Scientists at the PGEN can now direct the insertion of DNA molecules into previously defined sites in the chromosome. In addition, the delivery process favors the insertion of a single non-rearranged molecule. This offers a more predictable and more precise delivery of genetic information.

Molecular approach to form hybrid seeds—An understanding of floral development is of critical importance to agriculture, since most food crops are the products of flowering. ARS scientists are testing whether particular pollen proteins are important for pollen function, by using a method called "antisense technology" to "turn off" a gene that is normally "on". For this research, scientists isolated and characterized a promoter of a gene designated LAT52 that is only "on" in the male parts of the flower. These promoter sequences were isolated from tomato, but they also work in other plants. We then used the pollen promoter to express an antisense copy of the LAT52 gene, and make transgenic plants carrying this construct. Pollen that carried this antisense construct could not fertilize the female. Further experiments indicated that the LAT52 protein is crucial for normal pollen hydration and germination. This information will be useful in construction of male sterile plants and facilitating hybrid seed production.

BYDV resistance—Barley yellow dwarf virus (BYDV) is the most prevalent virus disease of small grains in the world. There is a need to develop small grain varieties with resistance to the disease since yield losses nationally average out at 3% and at local levels the losses can be 40–50%. PGEN scientists developed methods to transfer BYDV resistance genes efficiently through biolistics (gene gunning) and culture to produce large numbers of transgenic plants. The modified transgenic plants are currently being field tested for BYDV resistance.

Efficient Monocot transgenic plant production—Monocots such as corn, wheat, rice, barley, sorghum and sugarcane have been the most difficult to get to accept new genes through genetic engineering techniques. A corn gene fragment, the ubiquitin-1 (Ubi-1) promoter, investigated at the PGEN, has been shown to be the strongest monocot promoter yet described, and in particular to be much more active in monocot cells than the 35S promoter, the most commonly used in plant bio-

technology today. For example, the Ubi-1 promoter is almost 100 times stronger than the 35S promoter in sugarcane cells. The strength of this UBI-1 promoter has already resulted in its use in the successful generation of transgenic plants of corn, rice, wheat and barley. Some potential practical applications have emerged already. For example, using Ubi-1 promoter, transgenic rice plants have been produced that effectively prevent infection by the sheath blight pathogen, *Rhizoctonia solani*. This promoter has now been distributed to over 150 laboratories and is being widely used in efforts to produce genetically engineered monocots.

Plant growth regulation by hormones—Plant growth and development is regulated by plant hormones, of which scientists at the PGEC have recently identified genes that are regulated by the plant hormone auxin. These genes encode proteins that regulate lateral root initiation. These proteins have structural features found in bacterial regulatory proteins. These proteins, the scientists think, regulate meristem activity, which are responsible for the branching and root initiation. The same group of scientists continues its pioneer work on understanding the regulation of ethylene production, the plant hormone responsible for plant senescence. They are currently attempting to engineer plants with limited capacity for leaf abscission.

Mr. DURBIN. Will any of the construction funding appropriated for fiscal year 1994 or requested in 1995 for Albany be used in support of the Center?

Dr. FINNEY. The fiscal year 1994 construction funding of \$1,161,000 for Albany was made available for partial funding of Phase VII of the modernization of the Northern Wing, Western Regional Research Center. The \$5.6 million in fiscal year 1995 for Albany was likewise requested to complete the total funding required to finance the construction of Phase VII, which is estimated at \$6.8 million.

Mr. DURBIN. What is the budget for the Center for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The budgets for the Plant Gene Expression Center for the fiscal years 1993, 1994, and 1995 are \$3,136,700, \$3,145,700, and \$3,172,100, respectively.

POTATO RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with potato research, by location.

Dr. FINNEY. A description of ARS potato research programs by location will be provided for the record.

[The information follows:]

ARS Headquarters—Funds maintained at headquarters are allocated for extramural research on ring rot, early dying and scab disease problems, aphid and beetle control, marketing, and variety development.

Albany, CA (PGEC)—Development of new genetic engineering techniques and gene expression of economically important genes in potato.

Albany, CA (WRRRC)—Improved potato quality using plant cell transformation and other genetic engineering techniques.

Athens, GA—Nondestructive measurement of potato quality.

Aberdeen, ID—Development of new improved pest resistant varieties and disease management strategies.

Beltsville, MD—Germplasm evaluation, enhancement, and breeding improved varieties; protoplast fusion and other genetic engineering techniques; processing germplasm introductions; pathogen-host interactions and genetics of pest resistance; and biological control of potato insects. Field trials in support of the breeding program are conducted at Presque Isle, Maine.

East Grand Forks, MN—Physical properties and other factors associated with processed potato quality, volatiles and prediction of potato quality from bulk storage, processing quality factors of potatoes following storage, evaluation of potential new varieties for processing attributes, and inhibition of sprouting.

Fargo, ND—Marketing, storage, and inhibition of sprouting.

Frederick, MD—Characterization and genetics of new and exotic strains of fungal pathogens of potato, especially the potato late blight disease pathogen.

Ithaca, NY—Evaluation of potato germplasm for nematode resistance; biology and integrated management of the golden nematode based on host resistance, cultural practices, biological control, and soil fumigation.

Orono, ME—Control of potato disease and nematodes, development of integrated pest management strategies, and determination of soil and water stress effect on potato production.

Wooster, OH—Management of potato insects.

Philadelphia, PA—Biochemical nature of the interaction of potato pathogens with host plant, mycotoxin production in plants, and improved food processing methods for potatoes.

Prosser, WA—Evaluation and enhancement of potato germplasm including use of genetic engineering techniques, development of new improved varieties, and methods of disease control.

Yakima, WA—Insect behavior, insect ecology, biological control and improved non-pesticidal methods to control potato insects.

Peoria, IL—Determination of the chemical mode of action of potato sprout inhibitors.

Madison, WI—Classification, evaluation, preservation, and distribution of introduced germplasm; potato genetics and cytogenetics; and protoplast fusion and other genetic engineering techniques.

Dr. DURBIN. By location, what is the funding and staff for potato research for fiscal years 1993, 1994, and 1995.

Dr. FINNEY. We will provide ARS funding and staff years on potato research by location and fiscal years for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA (PGEC)	\$232,500	1.0	233,500	1.0	\$254,300	1.0
Albany, CA (WRRG)	1,300,400	4.7	1,417,700	4.9	1,429,600	4.9
Athens, GA	35,000	0.2				
Aberdeen, ID	389,400	1.5	393,400	1.5	396,700	1.5
Orono, ME	592,900	2.8	599,900	2.8	604,900	2.8
Beltsville, MD	3,148,700	12.5	3,320,200	12.5	3,348,000	12.5
Frederick, MD	58,800	0.3	169,600	0.3	171,000	0.3
E. Grand Forks, MN	1,061,000	5.4	1,066,700	5.4		
Fargo, ND	285,900	1.3	290,200	1.3	292,600	1.3
Ithaca, NY	270,300	1.2	273,600	1.2	275,900	1.2
Wooster, OH	24,300	0.1				
Philadelphia, PA	153,200	0.6	155,500	0.6	156,800	0.6
Prosser, WA	1,024,900	5.1	1,038,800	5.1	1,047,500	5.1
Yakima, WA	803,200	3.5	846,300	3.5	853,400	3.5
Peoria, IL	258,500	1.0	262,400	1.0	264,600	1.0
Madison, WI	619,100	2.8	625,700	2.8	631,000	2.8
Headquarters ¹	1,422,900	0.0	1,422,900	0.0	1,422,900	0.0
Total	11,681,000	44.0	12,116,400	43.9	11,189,200	38.5

Funds provided for cooperative research to the following States: Idaho, Massachusetts, Maryland, Michigan, Minnesota, North Carolina, North Dakota, New York, Ohio, Oregon, Pennsylvania, Virginia, Washington, Wisconsin, and Wyoming.

Mr. DURBIN. Please provide for the record a table showing the research funding devoted to ring rot, early dying, marketing, aphids, potato beetle, weeds, variety development, soils, and agricultural engineering for fiscal years 1993, 1994 and 1995.

[The information follows:]

	Fiscal year—		
	1993 funds	1994 funds	1995 funds
Ring Rot	\$470,000	\$417,800	\$421,500
Early Dying	911,600	672,700	676,300
Marketing	2,221,900	2,351,600	1,295,600
Aphids	464,900	928,800	936,600
Potato Beetle	1,439,100	1,650,800	1,674,700

	Fiscal year—		
	1993 funds	1994 funds	1995 funds
Weeds			
Variety Development	1,894,900	1,985,800	2,002,400
Soils	236,800	242,100	244,100
Agricultural Engineering	336,800	338,500	
Total	7,976,000	8,598,100	7,253,200

RUSSIAN WHEAT APHID

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with the Russian wheat aphid, by location.

Dr. FINNEY. ARS research objectives on Russian wheat aphid by location will be provided for the record.

[The information follows:]

Beltsville, MD—Provide a predictive classification for aphids that will aid in development of control methods. Participate in the international program for biological control of Russian wheat aphid.

Brookings, SD—Investigate seed treatments and genetic modifications for protection of wheat from Russian wheat aphid.

Columbia, MO—Genetically characterize parasitoids of the wheat aphid to enhance likelihood of establishment in the United States.

Ithaca, NY—Investigate fungal insect pathogens for control of Russian wheat aphids.

Manhattan, KS—Identify resistance to Russian wheat aphid in wild plants for incorporation into wheat germplasm by genetic manipulation.

Montpellier, France—Discover, collect, and evaluate predators and parasites of Russian wheat aphid in France, China, Hungary, Israel, and Russia.

Newark, DE—Evaluate exotic predators and parasites of Russian wheat aphid in quarantine.

Stillwater, OK—Identify and characterize genotypes of cultivated and related wheat and barley species that are resistant to Russian wheat aphid and release cereal germplasm to breeders. Rear, release, and evaluate natural enemies of the Russian wheat aphid for the control of this insect pest.

Mr. DURBIN. By location, what is the funding and staff for Russian wheat aphid research for fiscal years 1993, 1994 and 1995?

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Newark, DE	\$34,200	0.2	\$34,800	0.2	\$35,100	0.2
Manhattan, KS	79,300	0.4	80,600	0.4	81,300	0.4
Beltsville, MD	44,400		45,100		45,500	
Columbia, MD	62,000	0.3	62,600	0.3	63,100	0.3
Ithaca, NY	263,800	1.0	225,400	1.0	227,300	1.0
Stillwater, OK	1,431,200	5.0	1,445,100	5.0	1,457,200	5.0
Brookings, SD	134,200	1.0	162,900	1.0	164,300	1.0
Montpellier, France	456,000	1.0	460,500	1.0	464,300	1.0
Total	2,505,100	8.9	2,517,000	8.9	2,538,100	8.9

SOYBEAN RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with soybean research, by location.

Dr. FINNEY. We have research on soybean at 36 locations. The objectives of this research by location will be provided for the record.

[The information follows:]

Albany, CA—Improvement of fatty acid components for industrial use.

Ames/Ankeny, IA—Cytogenetic stocks, molecular map, genome, farm management.

Athens, GA—Seed quality measurements and identify toxic compounds.

Auburn, AL—Manage traffic and tillage to improve production.

Beltsville, MD—Soil/water, breeding/genetics, plant physiology, pathogen/weeds, and management/crop models.

Brookings, SD—Integrated crop management system.

Columbus, OH—Production optimization and water quality.

Columbia, MO—Cropping systems and water management strategies.

Coshocton, OH—Management practices for erosion control and water quality.

Fargo, ND—Pest control strategies through molecular approaches.

Florence, SC—Development of cropping systems to optimize water management.

Fort Collins, CO—Acquire, maintain, and preserve germplasm.

Frederick, MD—Molecular characterization of soybean dwarf virus.

Gainesville, FL—Environmental and physiological limitations, and genetics.

Ithaca, NY—Genetics and nutritional quality.

Jackson, TN—Host resistance to soybean cyst nematodes.

Lincoln, NE—Management practices to maximize production efficiency.

Madison, WI—Minimize harmful effects of bacterial pathogens.

Manhattan, KS—Volatile compounds from grain and handling technology.

Mayaguez, PR—Provide winter nursery facilities.

Morris, MN—Environmental and crop management limitations to production.

New Orleans, LA—Develop oilseed byproducts and value added products.

Oxford, MS—Develop sustainable cropping system.

Peoria, IL—Product development, conversion, and new uses.

Raleigh, NC—Genetics, physiological limitations, and production.

Riverside, CA—Develop salt tolerant cultivars.

Rotterdam, The Netherlands—Export quality.

St. Paul, MN—Management and cropping practices affecting water quality.

Stoneville, MS—Germplasm, insect resistance and weed control.

Stuttgart, AR—Develop cropping systems approach to weed management.

Tifton, GA—Pesticide technology for nematodes, weeds, and insects.

Urbana, IL—Germplasm/genetics, plant physiology, ground water, weed control, pathogens, management, and modeling.

Watkinsville, GA—Cropping systems and ground water pollution.

West Lafayette, IN—Management, weed/disease control, protein production, and expert systems.

Wooster, OH—Pest control and management/genetic practices.

Wyndmoor, PA—Soil nutrient uptake and oil products for industrial food use.

Mr. DURBIN. What are some of the agency's accomplishments in soybean research in recent years?

Dr. FINNEY. New uses continue to be developed for soybean oil. Soybean inks account for 33 percent of ink used in the newsprint business and have been shown to be more environmentally friendly than petroleum based inks. Complete conversion to 100 percent soy ink for newsprint purposes would create a market for 2.5 billion pounds of soybeans. Modified soy oil continues to be evaluated as an alternative for diesel fuel, using unique combinations of vegetable oil and alcohol. This technology is at the commercial testing stage. Soybean oil is also finding use as a spreading agent in conjunction with herbicide application, and as a dust retardant in elevator handling operations. Soybean protein has recently been converted into plastic film and coatings, and is now used in packaging materials and drink cups for moisture resistance.

A significant breakthrough in soybean germplasm collection was realized when some 500 new accessions from China were obtained. Additional lines are expected soon that will greatly expand the genetic diversity of the ARS soybean germplasm collection at Urbana, IL. Soybean lines with less than 2 percent linolenic acid content have been developed that will decrease processing costs needed to remove linolenic acid to prevent off-odors. The projected cost savings for processors is about \$200 million per year. Kunitz, a recent

jointly released cultivar with the University of Illinois, lacks an enzyme which interferes with protein digestion by people and animals, thus saving processing costs. Progress continues in identifying new lines with resistance to nematode infections and other disease organisms.

Mr. DURBIN. By location, what is the funding and staff for soybean research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff for soybean research for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Location	Fiscal year 1993—		Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Albany, CA	\$324,100	1.4	\$555,600	2.4	\$560,300	2.4
Ames/Ankeny, IA	893,700	3.3	903,300	3.3	910,900	3.3
Athens, GA	141,000	0.6	168,900	0.6	170,300	0.6
Auburn, AL	198,800	0.8	201,400	0.8	205,500	0.8
Beltsville, MD	4,165,700	18.8	4,436,100	18.8	4,473,200	18.8
Brookings, SD	243,600	1.1	26,200	0.1	26,400	0.1
Columbus, OH	135,100	0.6	158,700	0.6	160,000	0.6
Columbia, MO	304,800	1.0	308,900	1.0	311,500	1.0
Coshocton, OH	69,600	0.3	70,600	0.3	71,200	0.3
Fargo, ND	75,400	0.3	79,600	0.3	80,300	0.3
Florence, SC	201,900	0.8	205,400	0.8	207,100	0.8
Fort Collins, CO	229,400	0.5	233,100	0.5	235,000	0.5
Frederick, MD	216,800	1.0	27,700	0.1	27,900	0.1
Gainesville, FL	206,500	1.3	209,700	1.3	211,400	1.3
Ithaca, NY	478,400	1.8	493,300	1.8	497,400	1.8
Jackson, TN	182,700	0.8	185,400	0.8	--	--
Lincoln, NE	211,400	0.7	213,300	0.7	215,000	0.7
Madison, WI	20,300	0.1	20,500	0.1	20,600	0.1
Manhattan, KS	132,700	0.7	135,200	0.7	176,900	0.8
Mayaguez, PR	120,800	0.1	122,300	0.1	123,400	0.1
Morris, MN	362,600	1.4	382,300	1.4	385,500	1.4
New Orleans, LA	1,5113,800	4.7	1,153,500	4.7	1,163,200	4.7
Oxford, MS	63,200	0.3	64,300	0.3	64,800	0.3
Peoria, IL	5,522,100	16.8	6,908,100	20.7	6,966,000	20.7
Raleigh, NC	1,011,700	6.6	1,020,300	6.6	1,028,800	6.6
Riverside, CA	47,100	0.3	47,900	0.3	48,200	0.3
Rotterdam, Neth.	67,100	0.2	68,500	0.2	--	--
St. Paul, MN	266,000	1.2	251,000	1.1	253,100	1.1
Stoneville, MS	3,011,400	10.7	3,155,200	10.7	3,181,700	10.7
Stuttgart, AR	104,000	10.7	104,400	10.7	105,300	10.7
Tifton, GA	188,400	0.9	177,200	0.8	178,700	0.8
Urbana, IL	2,586,300	11.2	2,621,500	13.2	2,643,500	13.2
Watkinsville, GA	70,800	0.3	97,700	0.3	98,500	0.3
West Lafayette, IN	971,900	3.7	936,800	3.5	944,700	3.5
Wooster, OH	296,500	1.4	301,000	1.4	303,500	1.4
Wyndmoor, PA	667,000	2.0	1,001,800	3.1	1,010,200	3.1
Headquarters	17,400	--	27,100	--	39,300	--
Total	25,320,000	98.4	27,073,800	104.1	27,099,300	103.2

SOYBEAN-BASED INK

Mr. DURBIN. What have been the developments with regard to the commercial use of soybean ink during the past year?

Dr. FINNEY. Two commercial developments have occurred this past year with regard to soybean-based ink. The ARS technology for offset newspaper ink consisting solely of soy oil and pigments was licensed to one company on a non-exclusive basis, and red and black sheet-fed inks were successfully formulated and tested on

commercial presses to print labels. The market for soybean-based ink continues to expand.

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with soybean-based ink, by location.

Dr. FINNEY. At the National Center for Agriculture Utilization Research—NCAUR—in Peoria, Illinois, we are developing resins, heat-setting lithographic and flexographic inks, and formulating black and red inks using 100 percent modified soy oil based vehicles. This formulation has the additional environmental benefit of improved biodegradability. Biodegradation of 100 percent soybean-based inks was faster and more complete than the commercial soy-petroleum or 100 percent petroleum vehicles. Testing of heat-set technology for use with slick, high clay content paper is underway. Sheet-feed ink for printing book-type paper in red and black is continuing as well as collaborative research on formulation evaluation with Lehigh University at Bethlehem, Pennsylvania. A cooperative project on newspaper deinking and paper recycling was initiated between NCAUR and Western Michigan University, Kalamazoo, Michigan.

Mr. DURBIN. By location, what is the funding and staff for soybean-based ink research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The Agricultural Research Service funding for soybean-based ink research at NCAUR, Peoria, Illinois was \$510,000 in fiscal year 1993 and estimated at \$517,000 in fiscal year 1994. This funding also supports a cooperative research agreement with Lehigh University in the amount of \$125,000 in each year. In fiscal year 1995, the funding is estimated to be \$521,300. Approximately one and one quarter scientist year was devoted for this project in fiscal year 1993, and one and one third scientist year in fiscal years 1994 and 1995.

Mr. DURBIN. Please describe the work underway at Lehigh University.

Dr. FINNEY. ARS works with Lehigh University to mill the heat-set ink formulations and evaluate their drying characteristics. The objective is to demonstrate the feasibility of soybean oil vehicles in heat-setting formulated inks.

Mr. DURBIN. What has the research at Lehigh accomplished to date?

Dr. FINNEY. Eleven new heat-set ink vehicles were prepared and characterized. Further refinements are necessary to achieve a satisfactory technology.

STEEP II RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with STEEP II research, by location.

Dr. FINNEY. ARS has two locations involved in STEEP II research, Pullman, Washington and Pendleton, Oregon. The Pullman location is determining how management-related soil microbial processes influence soil quality as it relates to soil resistance to erosion, productivity, water quality and other changes in the ecosystem. On virgin prairie and wheatland under conventional and conservation tillage, nitrogen leaching is being studied to evaluate the effects of management practices on ground-water quality. The

longevity of crop residue fractions is being established as an aid to improved understanding of using residues to decrease soil erosion.

At Pendleton, in response to a major Soil Conservation Service need for evaluating erosion control for compliance with the 1985 Farm Bill, new methods are being developed for measuring the stability of soil surface roughness and porosity. Conservation methods are also being evaluated for alternative harvesting methods and for tilling frozen soil in fields seeded to winter wheat. The work is aimed primarily at improving erosion control on summer fallow fields where residue cover is often low following winter wheat seeding. Methods are being developed to control downy brome on conservation tillage land, which provides conditions under which the winter annual weed thrives. Deficiencies with erosion prediction from weather effects are being corrected to improve erosion models for the Pacific Northwest. Current erosion prediction models are being modified to account for extreme, rare weather sequences which often are the cause of major runoff and soil loss in the region.

Mr. DURBIN. What are some of the accomplishments of this research?

Dr. FINNEY. Three examples which are indicative of the important work being done in this area include:

We have significantly improved our soil loss prediction technology, which is used by the Soil Conservation Service, to set guidelines for establishing conservation plans for 1985 Farm Bill compliance. We learned that denitrification may reduce nitrate movement into ground water of the steep Palouse wheatlands during the wintertime. Together with improved fertilizer management, this finding should help minimize the threat of nitrate pollution of underground drinking water supplies. Also, frozen soil tillage increases water infiltration, thus reducing runoff and, probably, erosion, without reducing wheat yields.

Mr. DURBIN. By location, what is the funding and staff for STEEP II research for fiscal years 1993, 1994, and 1995?

[The information follows:]

In FY 93, \$188,600 and 1.2 scientists (SY) were devoted to this work at Pullman, Washington, and \$464,100 with 2.9 SY in Pendleton, Oregon. For FY 94, the numbers were \$189,500 (1.2 SY) and \$471,200 (2.9 SY); and for FY 95, \$191,100 (1.2 SY) and \$475,600 (2.9 SY).

SWEETPOTATO WHITEFLY

Mr. DURBIN. Please describe for the Committee the work you have underway on sweetpotato whitefly.

Dr. FINNEY. The research objectives to solve the sweetpotato whitefly (SPW) problem, by locations, will be provided for the record.

[The information follows:]

Albany, CA.—Development of molecular methods for identification and characterization of sweetpotato whitefly biotypes.

Beltsville, MD.—Pest management systems for greenhouse and nursery crops and the development of a naturally-occurring pesticide from the *Nicotiana* (tobacco) plant.

Charleston, SC.—Research on sweetpotato whitefly tolerant plant varieties and the biology of the sweetpotato whitefly in the southeastern United States.

College Station, TX.—Development of improved pesticide application technology for the sweetpotato whitefly.

Fargo, ND.—Investigation of the chemical characteristics of the wax coating that make up the outer coating of whiteflies and determination of the physiological importance of the coatings.

Ithaca, NY.—Introduction and preliminary evaluations of microbial biocontrol agents.

Montpellier, France.—Exploration for and introduction of exotic parasites, predators, and microbial biocontrol agents for the sweetpotato whitefly.

Newark, NJ.—Introduction and preliminary evaluation of exotic parasites and predators.

Orlando, FL.—Development and evaluation of naturally-occurring growth regulators; investigation of the correlation between incidence of SPW and irregular ripening in tomato and silver leaf in squash; development of integrated pest management systems for the southeast.

Phoenix, AZ.—Research on the identification and evaluation of naturally-occurring predators; development of techniques for mass production of natural enemies; evaluation of the biological characteristics of the B-biotype (now thought to be a new species named the silver leaf whitefly); development of integrated pest management approaches for the SPW in the desert southwest cropping system.

Salinas, CA.—Investigations of virus-vector relationships and effects of naturally-occurring plant virus reservoirs on the incidence of viral diseases.

Tifton, GA.—Evaluation of the SPW as a pest of peanuts and the development of management and control technologies on peanuts.

Weslaco, TX.—Greenhouse and field evaluations of new pesticides and application technology; investigations of insect-specific fungi for control of SPW; exploration, introduction and evaluation of exotic biocontrol agents.

Mr. DURBIN. Please describe the need for this research.

Dr. FINNEY. The sweetpotato whitefly has caused significant damage to food and fiber crops in California, Arizona, Texas, Florida, Georgia, and Hawaii and in greenhouses across the United States. Losses in the United States are estimated to exceed \$200 million annually. Additionally, the SPW and the diseases it vectors have become international pests and many developing countries are looking to the United States for research leadership. In response to the menacing threat to agriculture, a coordinated effort was developed by USDA agencies, university research and extension specialists, private industry, and commodity groups to identify the nature of the problem and to establish a Five-Year Research and Action Plan. This plan represents a united commitment to solve the whitefly problem. While the SPW Working Group has made excellent progress, the SPW continues to be a threat to major segments of American agriculture. This pest is causing increasing economic losses in the San Joaquin Valley of California. Also, the incidence of whitefly-vectored diseases has increased in Florida, Arizona, Texas and California. Hawaii also has reported significant losses in agricultural revenues due to this pest. The expanding territory and the increasing incidence of vectored diseases clearly shows the need for research efforts on this pest.

Mr. DURBIN. What developments have occurred during the past year?

Dr. FINNEY. During the past year, we have made significant progress against the sweetpotato whitefly. We have defined the population dynamics of this pest including daily activity dispersal patterns, contributions of weed hosts to population growth, standardized sampling for adults and nymphs, identification of vectored diseases, crop preference, and impact of irrigation, fertilization and plant growth regulators on population growth. Additionally, 4 new insecticides have been registered for this pest, pesticide resistance management programs have been planned and implemented, application technology has been improved, and several biorational mate-

rials such as soaps, oils, and insect specific fungi have been evaluated with varying degrees of success. Impacted States are using the available research data to design and implement pest management programs for the cropping conditions in specific areas. An audio-visual set was developed on whitefly for national distribution which highlights management recommendations.

Mr. DURBIN. By location, what is the funding and staff for sweetpotato whitefly research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff for sweetpotato whitefly research for fiscal years 1993, 1994, and 1995, by location, will be provided for the record.

[The information follows:]

Location	Fiscal year 1993 actual—		Fiscal year 1994 estimated—		Fiscal 1995 estimated—	
	Funds	Scientists	Funds	Scientists	Funds	Scientists
Phoenix, AZ	\$485,100	2.3	\$1,114,800	3.3	\$1,124,100	3.3
Albany, CA	56,800	0.3	57,600	0.3	58,100	0.3
Salinas, CA	36,400	0.1	37,300	0.1	37,600	0.1
Newark, DE	34,200	0.3	34,800	0.3	35,100	0.3
Orlando, FL	122,400	0.6	257,100	0.6	259,300	0.6
Tifton, GA	73,900	0.3	75,100	0.3	75,700	0.3
Beltsville, MD	286,800	1.4	362,200	1.4	365,200	1.4
Ithaca, NY	87,900	0.3	75,100	0.3	75,700	0.3
Fargo, ND	205,900	1.9	209,000	1.9	210,800	1.9
Charleston, SC	233,200	1.0	394,000	1.0	397,300	1.0
College Station, TX .....	.....	.....	310,600	1.2	313,200	1.2
Weslaco, TX	584,300	2.4	869,200	2.4	876,500	2.4
Montpellier, France	108,100	0.6	109,200	0.6	110,100	0.6
Total	2,315,000	11.5	3,906,000	13.7	3,938,700	13.7

TAXOL RESEARCH

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with taxol research by location.

Dr. FINNEY. Taxol is one of several taxane compounds that occur naturally in native and ornamental species of yew. The Food and Drug Administration's conditional use approval in January 1993 for use in treating breast and ovarian cancer in women has solidified the commitment of the National Cancer Institute and their industry cooperator, Bristol-Myer Squibb, to taxol production and evaluation. Taxol can be acquired in three ways—isolation of the natural product; chemical synthesis or semi-synthesis from natural taxanes; and isolation from cell culture. In 1991, ARS patented an environmentally benign cell culture process that produced taxol yields equivalent to that found in native bark. ARS researchers at Ithaca, New York continue to improve taxol yields as part of a collaborative effort between Phyton Catalytic, Inc., Hauser Chemical, Cornell University and ARS which is funded by a 5-year NCI grant of \$300,000 to optimize a bioreactor system for taxol. Using classical selection procedures we have increased cell cultural yields 10-fold, from 2 mg to 25 mg per liter. Through a National Research Initiative grant of \$50,000 per year for 2 years, ARS also continues to develop improved methods for taxane extraction from yew needles rather than bark.

Mr. DURBIN. What is the funding and staff for taxol research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The ARS base funding for taxol research for fiscal 1993 was \$46,500. In fiscal years 1994 and 1995, the funding is estimated at \$64,000 and \$64,600 respectively in addition to the grant funds noted above. The scientist years are approximately one-fifth of a scientist time for each year.

TROPICAL/SUBTROPICAL RESEARCH

Mr. DURBIN. Please describe for the Committee the tropical and subtropical research being carried on under Section 406 of the Agricultural Trade and Development Assistance Act.

Dr. FINNEY. ARS conducts tropical and subtropical research in Hawaii and Puerto Rico under Section 406 of the Agricultural Trade and Development Assistance Act. In Hawaii, our research programs are directed to postharvest quarantine treatments to enhance the export of tropical fruit crops grown in production and marketing of certain horticultural and forage crops. Emphasis is placed on evaluation of new crop varieties and species thought to have economic potential for development of cultural management practices for specific crops in the Carribean Basin. Emphasis is placed on fruit crops, vegetables, cereal crops, coffee, cacao, and trannier and other root crops. We also have educational programs in Puerto Rico in which individuals receive training on production and marketing of individual crops. These specialists then return to their farming communities and production areas to help train others in tropical/subtropical agriculture.

Mr. DURBIN. By location, what is the budget for this research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The budget for this research by location for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Location	Fiscal year—		
	1993 funds	1994 funds	1995 funds
Honolulu, HI	\$164,300	\$166,500	\$167,900
Mayaguez, PR	670,400	679,200	684,900
Total	834,700	845,700	852,800

Mr. DURBIN. What is the total USDA budget for tropical/subtropical research for fiscal years 1993, 1994, and 1995, by location?

Dr. FINNEY. The total USDA budget for tropical/subtropical research for fiscal years 1993, 1994, and 1995 will be provided for the record.

[The information follows:]

Agency	Fiscal year—		
	1993 funds	1994 funds	1995 funds
ARS	\$834,700	\$845,700	\$852,800
CSRS	13,888,000	13,734,000	9,646,000
Total	14,722,700	14,579,700	10,498,800

TURKEY OSTEOMYELITIS

Mr. DURBIN. Please describe for the Committee the work you are doing in connection with turkey osteomyelitis, by location.

Dr. FINNEY. The ARS research program on leg problems or diseases in turkeys and other poultry was initiated in fiscal year 1991 at the Poultry Production and Products Safety Research Laboratory in Fayetteville, Arkansas. The objectives of the program are to identify the causes of osteomyelitis in turkeys and other poultry, to define the disease processes, and to develop methods to treat or prevent these diseases in commercially produced poultry.

Mr. DURBIN. Please describe the need for this research.

Dr. FINNEY. The presence of osteomyelitis and other leg problems has been identified by the commercial poultry industry as a significant cause of poultry carcass condemnation and associated economic losses. The cause of these diseases in turkey poult and other poultry is not known. These problems include osteomyelitis, which is infection inflammation of the bones; tibial dyschondroplasia, or abnormal cartilage growth at the ends of the leg bone; and synovitis, which is infectious inflammation of the membranous lining of the joints in turkeys. Frequently, these diseases are associated with undesirable discoloration of the livers of affected poultry.

Mr. DURBIN. By location, what is the funding and staff for turkey osteomyelitis research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. The funding and staff for turkey osteomyelitis research during fiscal year 1993 was \$403,100 and supported two scientists. In 1994 and 1995, the estimated funding will be \$531,800 and \$536,200, respectively, supporting two scientists each year. The turkey osteomyelitis program is located at Fayetteville, Arkansas.

URBAN PEST CONTROL RESEARCH

Mr. DURBIN. Please describe the work you have underway on urban pest control research. Last year Congress provided additional funds for urban pest control research. How are these funds being used?

Dr. FINNEY. Urban pest control research emphasizes the development of new and innovative technologies to control cockroaches, fleas, and pest ants in the urban environment while reducing human exposure to pesticides. This effort incorporates biological control, structural modification, multipurpose baits, repellent technologies, and selective use of traditional chemicals into integrated management strategies. Additional funds provided last year are being used for research to develop a new concept of using baits for flea control, to devise new flea repellents, and to develop alternatives for the control of pesticide resistant flea populations.

Mr. DURBIN. By location, what is the funding for urban pest research for fiscal years 1993, 1994, and 1995?

Dr. FINNEY. All ARS urban pest research is conducted at the Imported Fire Ant and Household Insects Research Unit, Medical and Veterinary Entomology Research Laboratory, Gainesville, Florida.

In fiscal years 1993 and 1994, funding was \$813,700 and \$823,600, respectively, and is estimated to be \$830,500 in fiscal

year 1995. Funds include \$122,926 for cooperative research on Formosan termites at the University of Hawaii.

STAFFING OF RESEARCH FACILITIES

Mr. DURBIN. Would you please provide for the record a table indicating, by location, your total laboratory capacity in terms of the number of scientists, indicating the total number of scientists assigned to that facility and the percent staffed?

[The information follows:]

Status of Staffing of Agricultural Research Facilities
as of October 31, 1993
(Expressed in terms of scientific personnel)

Location	Total Capacity (Scientist)	Total In Use (Scientist)	Percent Staffed
Alabama: Auburn	13	11	85
Arizona:			
Phoenix	41	30	73
Tucson	39	39	100
Arkansas: Booneville	10	10	100
California:			
Albany	202	190	94
Davis	10	4	40
Fresno	31	29	94
Pasadena	26	17	65
Riverside	30	30	100
Salinas	14	13	93
San Francisco	28	27	100
Colorado:			
Akron	10	9	90
Ft. Collins	50	46	92
District of Columbia	27	23	85
Florida:			
Gainesville	65	65	100
Miami	10	9	90
Orlando	32	26	81
Winter Haven	20	8	40
Georgia:			
Athens	135	105	78
Byron	18	11	61
Dawson	14	13	93
Savannah	28	13	46
Tifton	35	29	83
Watkinsville	18	12	67
Hawaii: Hilo	22	16	73
Idaho:			
Boise	14	14	100
Dubois	10	7	70
Kimberly	20	18	90
Illinois: Peoria	180	134	74
Indiana: W. Lafayette	17	17	100
Iowa:			
Ames	130	94	72
Ames/Ankeny	30	28	93
Kansas: Manhattan	47	33	70
Louisiana:			
Baton Rouge	10	8	80
New Orleans	139	110	79
Maine: Orono	10	6	60
Maryland:			
Beltsville	615	556	90
Frederick	26	14	54
Hyattsville	10	5	50
Massachusetts: Boston	50	50	100
Michigan: East Lansing	24	24	100
Minnesota: Morris	25	17	68
Mississippi:			
Mississippi State	47	47	100
Oxford	29	26	90
Stoneville	61	51	84
Montana:			
Bozeman	10	6	60
Sidney	11	7	64
Miles City	10	10	100

Status of Staffing of Agricultural Research Facilities (continued)

Location	Total Capacity (Scientist)	Total In Use (Scientist)	Percent Staffed
Nebraska: Clay Center	75	53	71
New Mexico: Las Cruces	16	16	100
New York:			
Ithaca	20	20	100
Plum Island	39	36	92
North Carolina:			
Oxford	16	12	75
Raleigh	36	36	100
North Dakota:			
Fargo	80	60	75
Grand Forks	34	33	100
Mandan	24	16	67
Oklahoma:			
Durant	21	21	100
El Reno	17	6	35
Lane	15	13	87
Stillwater	19	15	79
Woodward	10	6	60
Oregon:			
Corvallis	27	27	100
Pendleton	14	14	100
Pennsylvania:			
University Park	25	19	76
Wyndmoor	150	124	83
Puerto Rico: Mayaguez	13	12	92
South Carolina:			
Charleston	14	12	86
Florence	15	15	100
South Dakota: Brookings	12	8	67
Texas:			
Bushland	29	19	66
College Station	56	52	93
Houston	58	41	71
Kerrville	21	13	62
Lubbock	20	20	100
Temple	34	34	100
Weslaco	46	46	100
Utah: Logan	27	27	100
Washington:			
Pullman	11	5	45
Wenatchee	15	9	60
Yakima	15	14	93
West Virginia:			
Beckley	18	16	89
Kearneysville	24	22	92
Wisconsin: Madison	19	18	95
Wyoming: Cheyenne	14	10	71
Subtotal, (85 (locations with capacity of 10 or more scientists)	<u>3,552</u>	<u>2,987</u>	<u>85</u>
All Other Contingency Fund locations (28 with capacity of less than 10 scientists)	<u>132</u>	<u>98</u>	<u>74</u>
Total, Federal facilities	<u>3,684</u>	<u>3,085</u>	<u>84</u>

Note: Number of Non-ARS Scientists included above -- 478

NEW RESEARCH FACILITIES

Mr. DURBIN. Please describe any laboratory space you have acquired during the past 12 months and indicate the reason why the facilities were acquired.

Dr. FINNEY. The Honey Bee Research Laboratory at Weslaco, Texas, with 16,440 square feet was completed during the past 12 months. This construction provides additional space needed for the development of technologies for the management of honey bees. The new laboratory will support two major research objectives: the management of domestic bees in the presence of Africanized honey bees, and the control of the tracheal mite, a devastating honey bee parasite. The HBRL plays a key national role in research activities on the Africanized honey bee.

RESEARCH FACILITIES RELEASED

Mr. DURBIN. Has any laboratory space been released by ARS in the past 12 months, and if so, please describe the reasons.

Dr. FINNEY. No laboratory space has been released by ARS in the past 12 months.

ARS-OWNED AIRCRAFT

Mr. DURBIN. Please provide for the record a listing of aircraft owned by the Agricultural Research Service, including where the aircraft are located, the types of aircraft, and how the aircraft were acquired. Also indicate for the record the number of flying hours for each of these aircraft during fiscal years 1992 and 1993.

Dr. FINNEY. The Agricultural Research Service owns and operates seven aircraft located at College Station and Weslaco, Texas. The information on these aircraft will be provided for the record. [The information follows:]

Location/Aircraft type	Method acquisition	Flying hours	
		Fiscal year 1992	Fiscal year 1993
College Station, Texas:			
Cessna T188C	Purchase	127	50
Cessna P206B	Excess	1	14
Cessna U206B	Excess	11	1
Helicopter, Hiller, 12E Acquired in FY 1992	Excess	6	30
Weslaco, Texas:			
Cessna TU206G	Excess	74	83
Cessna 182J	Excess	22	2
Aero Commander 680	Excess	84	90
Total for all aircraft .....	.....	325	270

Mr. DURBIN. In fiscal year 1992, the Cessna P206B was used for only one flying hour. How can you justify owning and maintaining an aircraft that has only flown for one hour?

Dr. FINNEY. The P206B aircraft is used in connection with the research to develop equipment for electrostatic charging of aerially applied spray, which is part of the Aerial Applications Research Unit's effort to reduce or eliminate spray drift, increase deposition of pesticides on target plants, and minimize contamination of sensitive areas with pesticides. The aircraft is equipped with an experimental electrostatic spray charging system. The installation of this

system requires special wiring harnesses inside the wings and fuselage, tanks and other hardware in the aircraft cabin, and experimental spray booms and hangers on the aircraft structure. The usage of the aircraft is determined by the timing of the development of the prototype equipment. This occurred in fiscal year 1992 and has been completed. Testing is underway and is reflected in the 14 hours of flying time in fiscal year 1993. Modifications will continue to be made to the system to evaluate new system concepts.

Mr. DURBIN. What were the fiscal year 1993 maintenance costs for each of the ARS-owned aircraft?

[The information follows:]

Location and Aircraft:		Maintenance costs
College Station, Texas:		
Cessna T188C		\$3,000
Cessna P206B		650
Cessna U206B		150
Helicopter, Hiller, 12-E		4,000
Weslaco, Texas:		
Cessna TU206G		4,632
Cessna 182J		none
Aero Commander 680		42,111
Total for all aircraft		54,543

FACILITIES REQUIREMENTS

Mr. DURBIN. Would you please list for the record all of your planned modernization or construction projects, showing both the facility and the estimated needs?

Dr. FINNEY. The list of planned modernization and construction projects for ARS will be provided for the record.

[The information follows:]

The following list includes projects which are currently being planned or are in the process of construction.

Estimated needs

Modernization:	Millions
Beltsville, Maryland	\$118.0
Albany, California	5.6
New Orleans, Louisiana	24.0
Peoria, Illinois	70.0
Plum Island, New York	90.0
Wyndmoor, Pennsylvania	39.0
Gainesville, Florida	9.0
Weslaco, Texas	16.3
Manhattan, Kansas	8.8
East Lansing, Michigan	15.6
Construction:	
Stuttgart, Arkansas	6.0
Parlier, California	24.4
Lubbock, Texas	9.9
Montpellier, France	2.6
Ft. Pierce, Florida	33.0
Athens, Georgia	3.5
Charleston, South Carolina	23.7
Ames, Iowa (Swine Center)	18.1

In addition, approximately \$250 million has been identified for modernization of other ARS locations, including adherence to existing Federal and state laboratory building codes.

MONTPELLIER, FRANCE

Mr. DURBIN. Would you please describe for the Committee the status of the relocation to Montpellier, France?

Dr. FINNEY. ARS research operations have been relocated to leased space in the Science Park at Montpellier, France.

The new European Biological Control Laboratory is being designed in three phases and will have approximately 800 to 1,700 gross square meters of office, laboratory, and headhouse/greenhouse space.

Design and construction will be accomplished using a competitively negotiated turnkey design/construction contract. Award of this contract was made in the first quarter of FY 1994 for design completion in the second quarter of FY 1995. The FY 1995 budget request for ARS includes \$2.6 million for construction of this facility.

Mr. DURBIN. Has the land at Behoust been sold?

Dr. FINNEY. The land at Behoust has not been sold. The real estate market has been adversely affected by the economic conditions in France. We are currently working with the Duchesse Anne Agency as our exclusive French real estate selling agent. We have updated the appraisal for the site, effective October 1993, to determine the most accurate fair market value. The current range is between \$576,000 and \$779,000.

FRESNO, CALIFORNIA

Mr. DURBIN. Would you describe for the Committee the status of the Fresno relocation?

Dr. FINNEY. The U.S. Horticultural and Water Management Research Laboratory requires a new permanent facility of approximately 78,000 gross square feet of research laboratory, office, headhouse/greenhouse, farm center, storage and shop space. Site development, additional land, and specialized equipment are also required. Total cost is \$27.3 million. In FY 1993, \$300,000 was appropriated for pre-design work from miscellaneous appropriation of \$1,270,000. An additional \$2,630,000 was appropriated in FY 1994 for planning and design.

A pre-design contract is scheduled to be awarded in the second quarter of FY 1994.

On June 26, 1992, ARS completed the acquisition of a 105-acre parcel of land in Parlier, California, for the Horticultural Crop and Water Management Research Laboratories. The purchase price for the site was \$1,000,000.

ORLANDO, FLORIDA

Mr. DURBIN. Would you please describe for the Committee the status of the Orlando relocation?

Dr. FINNEY. ARS signed a sublease agreement with the University of Florida, Institute of Food and Agricultural Sciences, on December 13, 1993, for two parcels of University-owned land totaling 190 acres in Ft. Pierce, Florida. One parcel, 18 acres located adjacent to the IFAS Research Center, will be the site of the new Horticultural Research Laboratory. The 172-acre farm site, which will be used for field plots, is approximately 1 mile from the first site. This

sublease agreement is being reviewed by the Board of Regents and the Trustees, UF. The target completion date for UF execution of the sublease is April 29, 1994.

Funding in the amount of \$400,000 for pre-design has been approved from the \$1,270,000 1993 appropriation for miscellaneous ARS facilities, France, Parlier, and Orlando. An additional \$2,900,000 was appropriated for design in fiscal year 1994. An architect-engineering firm has been selected for design of the facility. A pre-design contract is scheduled to be awarded in the third quarter of fiscal year 1994.

BUENOS AIRES, ARGENTINA

Mr. DURBIN. What work is carried out at the facility in Buenos Aires, Argentina and what is the annual budget?

Dr. FINNEY. This laboratory conducts research to identify biological control agents which can be used against immigrant pests in the U.S. originating from South America. Biocontrol agents that are found to be environmentally safe and specific for the target pest, are shipped to ARS quarantine laboratories which subsequently release the biocontrol agents to ARS laboratories for implementation. Current pests being investigated in Buenos Aires are imported fire ant, corn root worm, pickleworm, snakeweed, and rangeland weeds. The annual budget for the Argentina laboratory is \$281,000 in fiscal year 1994.

SEOUL, KOREA

Mr. DURBIN. What work is carried on in Seoul, Korea and what is the annual budget?

Dr. FINNEY. The mission of this laboratory was to identify biological control agents that could be used against immigrant pests originating from the Orient. Targets were Asian gypsy moth, and aquatic weeds in support of the U.S. Army Corp of Engineers. ARS has closed this laboratory as an economy move and transferred the responsibility to the Sino/American Biological Control Laboratory, Beijing, China. The Seoul project was funded by ARS at \$180,000 in fiscal year 1993. These funds and scientist have since been reassigned to the biological control program at Ft. Lauderdale, FL.

REPAIR AND MAINTENANCE

Mr. DURBIN. What is your planned budget for repair and maintenance of facilities in fiscal year 1994?

Dr. FINNEY. The fiscal year 1994 budget for repair and maintenance of ARS facilities totals \$14,246,305.

Mr. DURBIN. How were these funds used in fiscal year 1993?

Dr. FINNEY. Some of the types of repair and maintenance projects funded in fiscal year 1993 include: switchgear repair, roof repair, HVAC repair, plumbing, electrical, fencing, painting, and pavement repair.

Mr. DURBIN. What was the largest single expenditure?

Dr. FINNEY. The largest single expenditure was for the construction award of Phases IV and V—Modernization, Western Regional Research Center, Albany, California. Phase IV was in the amount

of \$3 million. Phase V was in the amount of \$4.4 million—for a total expenditure of \$7.4 million.

CONTINGENCY FUND

Mr. DURBIN. Please describe the Contingency Fund that was established by Congress in 1962 and explain how these funds are used.

Dr. FINNEY. The Contingency Research Fund, established by Congress in fiscal year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the Fund are generally made in situations where an emergency situation exists, such as an unexpected scientific "break-through," or outbreaks of diseases or pest problems where it appears inadvisable to wait for consideration of additional funding through the regular budget process. Funds are also used to make emergency facility repairs. In allocating these funds, the agency policy is to make no commitment beyond the current fiscal year.

Mr. DURBIN. How much is included in the fiscal year 1995 request and is that amount adequate? Inflation has raised costs by a factor of five; has the Fund been adjusted accordingly over the years?

Dr. FINNEY. The fiscal year 1995 request is \$928,523. This amount appears to be adequate. The Fund has not been adjusted for inflation over the years.

Mr. DURBIN. What use have you made to date of the Contingency Fund in fiscal year 1994?

Dr. FINNEY. To date, we have not expended any Contingency Funds in fiscal year 1994.

SPECIAL FUND

Mr. DURBIN. Please describe how the Special Fund is used.

Dr. FINNEY. The Special Fund is used to provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field.

Mr. DURBIN. Is this fund a separate account or are the funds merged with your base account?

Dr. FINNEY. The "Special Fund" is not a separate account but is merged with the base account.

Mr. DURBIN. Is there any advantage to having this \$2,500,000 maintained as a separate account?

Dr. FINNEY. Prior to fiscal year 1976, these funds were maintained at headquarters and released to the field locations on a temporary basis each year and were tracked by use of a special accounting code. In the fiscal year 1976 Allocation process, it was determined that there was no need to track these funds separately any longer because ARS was spending much more in contracts and cooperative agreements for hiring additional labor, subprofessional, and junior scientific help than the language required. ARS currently has in place a unique object class code that captures all obligations by location, area level, and agency summary for these types of contracts and cooperative agreements for reporting purposes. The Agency currently expends \$27.4 million for research support

agreements. In this regard, we see no advantage in maintaining this account separately.

SCREWWORM PROGRAM

Mr. Skeen.

Mr. SKEEN. Thank you, Mr. Chairman. Dr. Plowman, I appreciated your comments on the screwworm program. I couldn't have said it any better, but if you think you're going to get a retraction out of the Washington Post, you are going to stand on your head for an hour.

Dr. PLOWMAN. Well, you can always hope.

Mr. SKEEN. I know, we can always hope, but I will attest to the fact that one of the finest programs I've had any personal experience with is the screwworm program. When I went back to the ranching business in about 1950, we spent 95 percent of our time doctoring screwworms to keep them from eating us alive.

Dr. PLOWMAN. That's right.

Mr. SKEEN. As a result of your work, within ten years, we had almost eradicated the entire problem. I think it has been one of the most magnificent research efforts that ARS has ever been involved in.

In addition to that, it has been exceptionally efficient, and well-run. I think it's well worth every dollar because eventually the consumers would have had to pay for the losses caused by the screwworm.

MEDFLY IN CALIFORNIA

Dr. PLOWMAN. Well, the biggest spin-off too, and that is that the technology that was developed to deal with the screwworm is the technology that we are now dealing with the Medfly in California.

Mr. SKEEN. Birth control.

Dr. PLOWMAN. It came right out of this program. You add that to the benefits, why, we're talking about big things.

BENEFITS OF AGRICULTURAL RESEARCH

Dr. FINNEY. And if I might add a comment, Mr. Chairman, the results of agricultural research very often extend beyond agriculture. This is a technology that has also been used by the United Nations and other countries overseas, and it has had some benefits in terms of control of the screwworm that is a threat to the human population.

WORLD FOOD PRIZE

I think the report that we saw last year when our scientists received the World Food Prize projected an \$8 billion benefit as a result of that technology, so I think that was an example that was not very well thought out, by the Pork-Busters.

CUTTING PROGRAMS

Mr. SKEEN. Well, I don't think we need to pontificate anymore about pork-busters or those folks. There is a group here in Congress that are so dedicated to budget reduction, and we all are, but you have got to do it with common sense. You can't just go in and

say we're going to cut this and that and the other, particularly if you don't understand what it's doing.

And my only argument with these folks that work in the blind like this, or are blindly lead, is that they never understand what they're talking about. They refuse to come talk to anybody that knows anything about it.

And that is a damnable trait from the very beginning because if you don't understand what's going on, then you shouldn't stand over there offering yourself as an expert on this kind of reduction. We have too many experts and not enough common sense involved in this thing.

My only argument with them is if they want to find out about a program, they ought to come and ask somebody that knows. Come to you folks or somebody else that might lead them to someone who has the scientific background.

Enough of the pontification, Mr. Chairman, but I would like to get on to this business of the reduction on the ARS facilities.

SAVANNAH, GEORGIA

We had a Member of Congress before us yesterday talking about this stored products research, insect research and development laboratory in Savannah, Georgia, and as you all know, it is one of the areas of doing research on high humidity and high temperature R&D lab, and prevention of insect infestations and stored agricultural products.

Why is ARS closing the lab, or proposing to close the lab?

FACTORS CONSIDERED IN CLOSING SAVANNAH LAB

Dr. FINNEY. There are several reasons, Mr. Skeen. First of all, this is one of our facilities that is in significant need of repair and maintenance. The physical conditions of the facility over the years has substantially declined, and of course, that has been a major concern that we have had with a number of our facilities, but this is particularly true for this lab.

Secondly, in terms of looking at the type of work that is going on in that laboratory, the Agency's position is that this work could be done in other facilities at other locations within the Agriculture Research Service.

For example, we have a grain marketing laboratory in Manhattan, Kansas that is involved in work on stored products control as well.

Mr. SKEEN. Is this one of the sites you are considering moving this lab to?

Dr. FINNEY. Part of the programs there would be carried on at other laboratories, so that is part of the rationale that we looked at in terms of that decision.

Mr. SKEEN. The facility is in bad repair.

Dr. FINNEY. Comparable facilities are available elsewhere within the Agency where those types of—

Mr. SKEEN. When you get close to the grain industry or grain production part of agriculture, I can understand that, but what about the elements of high humidity and some of the things that propagate the kinds of insects that infest agricultural products?

Dr. FINNEY. Well, of course—

Mr. SKEEN. Can you control those conditions?

GAINESVILLE, FLORIDA

Dr. FINNEY. We would have other facilities at Gainesville, Florida where we have a major entomology program where we would pick up some components of that, so it's a process where we would carry out those programs that would need to be carried out to service the industry at other locations.

Mr. SKEEN. The reason I brought it up is because evidently, you have a score sheet process that you use on evaluating these laboratories and their effectiveness.

Dr. FINNEY. Yes, we have.

RELOCATION OF FLORIDA HORTICULTURAL LAB

Mr. SKEEN. Well, there's an article in the Naples, Florida Daily News that raised this business about the relocation site of the Florida Horticultural Lab, and the selection site was done on the basis of score sheets. Explain that to me.

Dr. FINNEY. Well, that was another issue, Mr. Skeen.

Mr. SKEEN. Help me divide the issues up so I understand it, so I don't join pork-busters or somebody.

[Laughter.]

Dr. FINNEY. Mr. Skeen, as you are probably aware, or you may not be aware, there was a need on behalf of the Department to look for a new site to build a new facility to address horticultural problems.

Mr. SKEEN. Out of Orlando, yes.

Dr. FINNEY. Out of Orlando because of urban encroachment and the need for that city to use that site for another purpose.

Mr. SKEEN. We participated in that discussion.

Dr. FINNEY. Yes. There was a review committee established to develop a list of criteria and to develop a scoring system for evaluating that criteria to determine which site would be the preferred site for the new laboratory that would be built to replace the Orlando facility.

I don't have before me that criteria, but I recall that some of the factors would have been, for example, the long-term growth of the industry over a number of years, the suitability of housing for the staff, supporting facilities like universities or other research programs.

So there was a list of, I believe, maybe 15 criteria that were developed. They were weighted and scored, and based on that type of criteria, that was the basis for making some assessment as to the preferred location.

So that was a different issue that we were dealing with, but there was a list of criteria that was developed for that decision.

Mr. SKEEN. Yes, I have the list before me that was printed in the paper, and I have to say it was pretty exhaustive as far as factors throughout.

Dr. FINNEY. Yes.

Mr. SKEEN. And of course, we're getting into a neighborhood fight.

Dr. FINNEY. We understand.

Mr. SKEEN. The difference between Immokalee?

Dr. FINNEY. Immokalee.

Mr. SKEEN. And Ft. Pierce.

Dr. FINNEY. And Ft. Pierce.

Mr. SKEEN. Right.

Dr. FINNEY. Yes.

Mr. SKEEN. Well, I appreciate the fact, and I wanted to understand the scoring system so that we know what we were talking about.

MARKETABILITY OF AGRICULTURE PRODUCTS

We talked about marketability of agriculture products when we went to the Southern Research Lab in New Orleans a year or so ago. We saw some wonderful new products—dairy products, milk fizz—I don't know how it tastes.

[Laughter.]

Mr. SKEEN. Some of the products were very good and I think milk fizz kind of turned me off.

[Laughter.]

Mr. SKEEN. But nevertheless, we still don't see many of the innovations that we saw then. Defatted peanuts was another one.

Dr. FINNEY. Yes.

Mr. SKEEN. Does the research group get into the marketability of these products, or is there any mechanism within the Department of Agriculture to foster this kind of marketability from the private sector?

CRADA'S

Dr. FINNEY. Yes, Mr. Skeen. One of the programs that has grown substantially within the Agricultural Research Service over the last few years has been our Cooperative Research and Development Agreements with the private sector.

Over the period since we began initiating this, we had some 360 Cooperative Research and Development Agreements with the private sector, I think one of the highest numbers of any Federal agency at that time. We have currently 180 agreements.

That's where we link up with a private firm where they do the market analysis, the economic analysis, and they look at the feasibility of moving these products into the commercial sector.

So that's our link that we have with the private sector in terms of market analysis and the economic feasibility of products. That's where we tie in, Mr. Skeen, on that area.

NUTRITION INITIATIVES

Mr. SKEEN. Let me ask you a question on nutrition. You spoke with the Chairman a moment ago about nutrition initiatives and how well you do.

I notice you are doing a lot with nutrition for children. What have been the findings that ARS has come up with as to whether or not meat should or should not be excluded in school lunch and breakfast programs?

Dr. FINNEY. I don't know whether we have looked at that particular issue?

Mr. SKEEN. I don't know if you have anything very specific.

Dr. FINNEY. Of course, we have a Children's Human Nutrition Research Center at Baylor College of Medicine.

Mr. SKEEN. Yes, sir.

Dr. FINNEY. Where they evaluate, of course, the well-being of children and infants based on their dietary patterns, and they have been particularly successful in terms of looking at the composition of the milk products that are essential for children and their diets at an early stage.

I don't have information at hand in terms of looking at the role of meat in the diet.

Mr. SKEEN. I would like very much if you do have that, to get it.

Dr. FINNEY. We can research that and provide that for the record for you, Mr. Skeen.

[The information follows:]

PROTEIN QUALITY AND AMINO ACID REQUIREMENTS OF CHILDREN

A response to proposals for changes in the meal composition of the school lunch program.

Peter Reeds, PhD Professor of Pediatrics,
Janice Stuff, MS, RD Research Instructor in Pediatrics,
USDA/ARS Children's Nutrition Research Center, Dept. of Pediatrics, Baylor College of
Medicine, Houston, Tx.

As we see it the following are issues that require attention

1. The current RDA for amino acids and protein
2. Whether this can be met from plant sources alone
3. The consequence of complete substitution of soy foods for meat products.
4. Alternatives to the "food group system"
5. Issues unrelated directly to amino acid nutrition

1. Recommended Dietary Intakes of Protein and amino acids

The current RDA for protein and amino acids (NRC, 1989) is based largely on the expert consultation WHO/FAO/UNU (1985). Both committees adopted a factorial approach to the problem. However results of recent isotopic studies performed over the last 7 years (e.g. Young et al 1989) has initiated a reappraisal of the present recommendations for intakes of some specific essential amino acids for adults. It is our opinion that some reappraisal of current amino acid patterns for children is also appropriate.

The results of particularly carefully conducted animal studies (Fuller et al, 1989) have generated precise values for contributions of different essential or conditionally essential amino acids to the so-called maintenance amino acid requirement. We see no biological reason to suppose that the conclusions drawn from these studies should not apply also to humans. That being so the results lead to questions with regards to the adequacy of current recommendations with respect to threonine and cysteine intake. Furthermore it is important to emphasize that the current recommendations concentrate on the utilization of dietary amino acids for the synthesis of structural proteins. However recent research has highlighted the fact that amino acids play obligatory roles as precursors for a number of nitrogenous compounds. Some of these end products of amino acid metabolism are of general physiological importance (eg purine bases, creatine, carnitine, taurine) and some play critical roles in the functioning of the central nervous (eg neurotransmitters, nitric oxide) and immune systems (eg glutathione and nitric oxide). There are good data to show that marginal amino acid nutrition is associated with poor success of vaccination. It is also of interest that investigations of the cognitive development of school age children in the developing world have suggested that specific foods (in this case animal products) seem to play a positive role that is not readily ascribed merely to the amino acid composition of these protein sources. This suggests that the *foods* in which primary nutrients are presented may have an important bearing on the adequacy with which these nutrients support the functional needs of the child. Similarly studies carried out in the UK (Lucas, 1992) of the long-term development of low birth weight infants also suggest specific benefits both of the consumption of human milk and of the early consumption of relatively high protein intakes.

Finally as with virtually all of the RDA's, that for protein and amino acids inevitably involved judgements with regard to "safe levels", protein digestibility and the difficult issue of potential variations in the efficiency with which absorbed amino acids are utilized for productive processes under different physiological circumstances. All three issues are subject to much current research (Grimble, 1991; Reeds, 1990 and Millward et al, 1991). There is for example evidence to suggest that, because of inefficient use of dietary protein the current recommendation for the protein intake of lactating women is inadequate (Motil et al 1990; Thomas et al 1990).

In Appendix 1 we have developed estimates of the minimal amino acid needs of children between 1 and 10 years of age. We have adopted the same approach as that used by the NRC expert committee. Estimates of the rate of protein deposition were based on 50th centile for weight gain in the NCHS standards, and we assumed that 25% of this weight gain was storage lipid and that protein contributed 16% of the remainder. We also calculated maintenance protein needs by using the observation that basal nitrogen losses are approximately 200 mgN/(body weight)^{0.75} across a wide range of ages and body weights (Reeds, 1990). These protein values were converted into amino acid mixtures with the use of a consensus value for the amino acid composition of the body protein of mammals to calculate the growth component (Davis et al. 1993) and using the data of Fuller et al (1989) to estimate maintenance needs. Our estimate differs from the current RDA in as much as it leads to a slightly lower overall recommendations for protein intakes for children < 2 years of age, but a higher recommendations for older children. The major difference between the results of our calculations are higher recommendations of RDI's for threonine, cysteine and histidine for all age groups.

Maintenance needs dominate the nutrient requirements of humans from approximately 1 year of age and research over the last 10 years has shown consistently that threonine and cysteine appear to play a specific role in individuals receiving diets that maintain them at body nitrogen equilibrium. Two plausible explanations for this finding can be offered. First that the protective mucoprotein secretions of the gut contain high contents of both and second that the maintenance of glutathione synthesis is a necessity for the maintenance of host defenses against peroxidative damage. Recent isotopic research carried out at the Children's Nutrition Research Center (Berthold et al., 1991) has shown specific sequestration of both amino acids, and especially cysteine, in the gut mucosa.

Plant storage proteins tend have a lower contents of threonine, histidine and methionine than animal products. Furthermore there is reason to believe that the physical nature of the plant products, together with the potential presence of antinutritional factors either associated with the plants themselves (e.g. lectins) or generated during processing, may stimulate secretory activity in the small intestinal lumen. This will increase the metabolic need for both amino acids.

2 & 3 Will a complete plant product-based meal provide an appropriate balance of amino acids ?

In Appendix 2 we show calculations of the essential amino acid compositions of the four main protein sources that might reasonably be found in a school lunch. In these calculations we have used wheat flour as the "grain" and because of limitations in the data base confine our calculations to "Soya protein isolate". We have in addition shown data for the native condition, i.e. before cooking or other processing and thus it is likely that the calculations give upper estimates. The calculations have been based on a 40 kg individual and have assumed that the non-milk components of the meal should supply 0.33 g protein per kg body weight.

The recommended base lunch, which includes 50g of meat, supplies approximately 52% of the protein RDA and hence achieves the nutritional target. Reassuringly the meal makes a larger contribution to the RDA for individual essential amino acids than it does for protein. It supplies 62% of the threonine, 55% of the histidine and 22% of the cysteine as calculated in appendix I. However as it supplies 139% of the methionine RDA so provides a significant excess of sulfur for cysteine synthesis.

Two meat-free, but milk-containing meals are then shown. These have been constructed so that soya product supplies either 27% (4.3 g) or 47% (8.8 g) of the protein, the remainder being made up from the grain and milk. These supply 40 and 47% of the protein RDA. Both are lower in threonine and histidine and still provide excess methionine as a buffer against the fact that they are cysteine "deficient".

Finally two plant based meals are presented. Soya provides 67% and 33% of the total protein which in its turn is 33% of the RDA. These diets just achieve the targets for threonine and histidine and are still low in cysteine. However these contain only just sufficient methionine to make up the cysteine deficit.

It is important to bear in mind that this comparison of meal patterns and metabolic requirements omits two key factors. First, without satisfactory data, we are forced to avoid questions of digestibility in its broadest sense and of course we can make no assessment of the impact of processing on the bioavailability of amino acids, such as lysine, methionine and cysteine, that may be chemically damaged during processing. Second our recalculated RDA contains little extra provision for circumstances (eg infection) under which metabolic requirements may be increased. There is no provision in either our model or that used by the NRC committee for other non-protein uses for amino acids.

Thus the RDA may be an underestimate of need and the meal composition may be an overestimate for supply.

For these reasons alone we can not see a good case in support of a major shift in protein sources. Indeed we have significant concerns about the amino acid adequacy of diets that contain no meat or dairy sources of protein. We feel that it is crucial to emphasize that the standards are minima. Given that many of the recipients of school lunches are from deprived sectors of the community and hence are at nutritional risk we would argue that, as responsible the goal should be to exceed this minimum standard.

4. *Nutrient based systems*

It seems to us that there are two issues raised by a move towards nutrient rather than food recommendations. The nutrient-based system has the advantage of accuracy and flexibility and by recognizing the need for nutrient targets is objective. On the other hand a large advantage of the food group system is its pragmatism, reflecting as it does the ideal of a mixed diet. Furthermore there is increasing evidence to suggest that the form in which nutrients are offered i.e. the foods in which they are contained may be important in a way that goes beyond classical views of digestibility and bioavailability. Moreover we would be concerned with whether nutrient recommendations would lead to confusion at the implementation level. Will a new method necessarily avoid the need for the specification of the food sources within the standard meals?

With regards to the widespread use of the PDCAAS test for amino acid adequacy. We are surprised by the comment in the discussion document with respect to the difficulty of applying this system to the assessment of the school meal. Data bases concerning the nutrient compositions of most of the foods that would be likely constituents of a meal that American children would find palatable are available. Furthermore, certainly as far as amino acid nutrition is concerned, it is our suspicion that only a limited series of major protein sources would be concerned and these fall into general categories i.e. grains, legumes, milk and dairy and meat. Indeed the data in appendix 2 is a minimal attempt to use current spread sheet approaches to the assessment of different mixtures of common constituents.

The main problem that we see is the crucial area of digestibility. This is a problem recognized by both the WHO and NRC committees. At the CNRC we are currently addressing this issue by using new isotopic approaches with intrinsically labeled food stuffs. We are currently developing the processing of ^{15}N labeled soya with the specific intention of examining its utilization by infants. This approach is applicable to many other common constituents of the meals of infants and children but lack of resources is hampering the rapid development of a methodology that could answer many of the questions of bioavailability highlighted in the preamble to current RDA's.

Other Nutritional Issues

The paper from Ms. Ford has concentrated on amino acids. In one sense this is entirely appropriate as this is an aspect of human food composition that can be manipulated only by manipulation of the foods within the diet. Although supplementation with crystalline amino acids is used in the animal feedstuffs industry it is surely out of the question from both the practical and financial points of view when applied to the human diet in general and the Federal food programs in particular.

Nevertheless it is quite clear that concerns over micronutrients are at least as important in these decisions. Existing regulations clearly recognize potential problems with zinc and iron and the same considerations apply to some water soluble (e.g. B_{12}) and, given the emphasis on the reduction of the lipid content of the diet, some lipid soluble vitamins. This would be of particular concern if milk or eggs were to be omitted from the meal.

Furthermore if extensive plant substitution of the current meal were to be permitted substantial concerns about calcium and other "macro" inorganic nutrients should be expressed. For example the current recommendations for the calcium intake of girls is the subject of reappraisal. Although, in theory, it could be argued that supplementation to the levels associated with the base meat-containing meal is possible this is to our mind unsatisfactory in principle. Questions of bioavailability still remain particularly as we consume foods and not

"a diet" and it seems inappropriate to use chemical supplementation when the nutrients can be supplied by common components of the mixed diet that forms the basis of the present recommendations.

Age (yrs)	Protein Intake	Amino acid need (mg/kg/d)										Sulfur	Total Aromatic
		lys.	thr.	meth.	cys.	phe.	tyr.	hist.	leu.	isol.	val.	tryp.	
1	0.98	33	39	10	29	20	20	30	40	15	20	8	39
2	0.98	31	37	9	28	18	18	29	37	14	18	7	37
3	0.98	29	36	9	27	18	18	28	38	13	17	7	35
4	0.99	28	34	8	27	17	17	27	34	12	16	7	33
5	0.99	27	34	8	26	16	17	27	33	12	16	7	33
6	0.99	26	33	8	26	16	16	27	32	12	15	6	32
7	0.99	27	33	8	26	16	16	27	33	12	16	7	32
8	0.98	27	33	8	26	16	16	27	33	12	16	7	32
9	0.98	27	33	8	26	16	16	26	32	12	16	6	32
10	0.98	28	33	8	25	16	16	26	32	12	15	6	32

"Dietary Protein Quality"
mg amino acid/g protein

	lys.	thr.	meth.	cys.	phe.	tyr.	hist.	leu.	isol.	val.	tryp.	Sulfur	Total Aromatic
1	29	34	8	25	17	17	26	35	13	17	7	34	34
2	27	33	8	25	16	16	26	33	12	16	6	33	33
3	26	32	8	24	16	16	25	32	12	15	6	32	32
4	25	31	7	24	15	15	25	30	11	14	6	31	30
5	24	30	7	24	15	15	24	30	11	14	6	29	29
6	24	31	7	24	15	15	24	30	11	14	6	31	29
7	24	30	7	24	15	15	24	30	11	14	6	31	29
8	25	31	7	24	15	15	24	30	11	14	6	31	30
9	25	31	7	24	15	15	25	30	11	15	6	31	30
10	25	31	7	24	15	15	25	30	11	15	6	31	30

APPENDIX 2

Essential and conditionally essential amino acids in the revised RDA and in some specimen meals

Meal											
Milk protein	7.9	7.9	7.9	0	0						
Meat protein	9.0	0	0	0	0						
Soy protein	1.8	4.4	8.8	8.8	4.4						
Wheat protein	1.8	3.5	1.8	4.4	8.8						
	RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA	Total %RDA
Protein	39.2	20.5	52	15.2	42	18.5	47	13.2	33	13.2	33
Lysine	1040	1469	141	1010	97	1260	120	704	68	532	51
Threonine	1320	836	63	629	48	752	56	469	35	424	32
Methionine	320	447	139	319	100	371	116	191	60	198	62
Cysteine	1000	222	22	210	21	237	24	215	21	261	26
Phc.	640	884	138	798	125	968	151	709	111	665	103
Tyrosine	640	762	119	660	103	786	122	480	75	432	67
Histidine	1040	578	55	420	40	507	48	353	33	329	32
Leucine	1280	1719	134	1379	108	1634	128	1038	81	964	75
Isoleucine	480	996	208	840	189	1009	210	628	131	532	111
Valine	600	1104	184	909	151	1056	176	646	108	620	103
Tryptophan	240	269	112	225	93	259	108	190	79	197	82
Total											
Sulfur	1320	669	51	529	40	608	46	406	31	459	34

ELIGIBILITY OF AMERICAN INDIAN TRIBAL COLLEGE

Mr. SKEEN. Let me ask you just one other question. Are the American Indian tribal colleges eligible for these special grants that we have historically offered to say black colleges and some of the rest?

LAND-GRANT COLLEGES

Dr. FINNEY. The answer to that is no, as I understand it. I believe the grants go to primarily land-grant colleges, either the 1862 or the 1890 institutions.

Mr. SKEEN. But there is a sovereignty question on that.

Dr. FINNEY. Am I correct on that, Dr. Plowman?

Dr. PLOWMAN. Yes. As you well know, there is an issue, I think, that legislation has been introduced about giving the 26 of those tribal colleges land-grant status.

Mr. SKEEN. Yes.

Dr. PLOWMAN. The Department has taken a hard look at that. We're all for anything that we can do to enhance educational opportunities of all groups, especially the minority groups, but we are concerned with what it means to give land-grant status in terms of future budgets.

So we're looking at that issue very carefully. We're also looking to see what other programs that might involve native Americans. I think last year in the Extension's budget, and we can talk about that a little bit tomorrow if you'd like to, there is some money in there to provide extension service on some of the Indian reservations.

Mr. SKEEN. We've had programs in the past that operated that way—the Cooperative Extension Service.

Dr. FINNEY. That's correct.

Mr. SKEEN. I know that's a real dicey question because of the issues associated with sovereignty.

Dr. FINNEY. Yes.

LOCOWEED RESEARCH

Mr. SKEEN. As you know, we have lost millions of dollars due to a severe outbreak of locoweed in New Mexico. Sheep, cattle, and horses graze on this addictive weed which causes abortions, birth defects, emaciation of adult livestock and behavioral abnormalities.

Dr. FINNEY. Locoweed grows in all western States and is a serious problem in Utah, Arizona, New Mexico, Texas, Colorado, Wyoming, and Montana. The primary effects of locoweed on livestock include emaciation, neurological disturbances, abortions, birth defects, congestive right heart failure, decreased growth rate, decreased fertility, and loss of libido. If grazed extensively, animals may die and animals that survive are often useless for breeding or food.

ARS research on locoweed is conducted at Logan, Utah. Laboratory studies are determining the amount and duration of locoweed ingestion by livestock necessary to cause reproductive dysfunction, and evaluating the metabolic fate of the locoweed toxin, swainsonine, in animal tissues and the residues that may result. In sheep, ARS is evaluating the effect of locoweed poisoning on

sheep and lamb behavior, and the progression and dose relationship of lesions. Grazing studies evaluate the effect of various environmental and pasture conditions on locoweed poisoning of cattle and sheep, and the relationship between the grazing experience of livestock and locoweed consumption. Management strategies to minimize locoweed poisoning and the potential for control with herbicides, or with plant pathogens or native insect biocontrol agents are being studied through a cooperative agreement from the Logan laboratory with New Mexico State University.

The funding for locoweed research at Logan, Utah was \$516,400 in FY 1993. For FY 1994 and 1995, funding is projected to be \$524,900 and \$529,300 with two ARS scientists working on locoweed research. This includes \$114,000 in support of a cooperative agreement with New Mexico State University.

JOJOBA

Mr. SKEEN. We talk about jojoba research each year. Would you talk about the differences between the nature of the jojoba research conducted at the National Research Center in Peoria, Illinois, and that of the research provided by New Mexico State University in the CSRS grant program? Would you expand on the differences between the two programs?

Dr. FINNEY. The New Mexico State University—CSRS grant program focuses on the agronomic, variety development and production management aspects of producing the jojoba crop. The program at the National Center for Agricultural Utilization Research in Peoria, Illinois, focuses on development of processes and products that create the value-added markets needed to sustain production of the crop.

BIOTECHNOLOGY

Mr. SKEEN. I am interested in the application of biotechnology to crop improvement. Can you describe what progress has been made in developing molecular genetic maps in crop plants?

Dr. FINNEY. Molecular genetic maps in various stages of development have been made on over 30 agriculturally important plants which includes alfalfa, apple, barley, bean, blueberry, cabbage, citrus, corn, carrot, cotton, Douglas fir, lettuce, millet, mungbean, oats, onion, peach, peanut, pepper, petunia, pine, poplar, potato, prunus, rice, rye, sorghum, soybean, strawberry, sunflower, sweetpotato, tomato, wheat, and wild rice.

Mr. SKEEN. This Committee is being inundated with requests for biotechnology research. Would you describe ARS's commitment in FY-1994 vs. your FY-1995 request for funding in biotechnology research?

Dr. FINNEY. The commitment of ARS to biotechnology research shows over a three million dollar increase over the FY 1994 level of \$112,423,000 to \$115,877,000 for FY 1995.

Mr. SKEEN. We had our first set of outside witnesses and a number of them testified I favor of ARS and CSRS biotechnology research. We are unable to fund them all, so should we encourage the private sector to move into some of these efforts?

Dr. FINNEY. It is understandable that Congress cannot fund all of the requests pertaining to biotechnology as the total dollars

needed to solve agricultural problems through the use of biotechnology tools would be very large, perhaps in the billions of dollars. Therefore, it is highly desirable and essential that private enterprise join the effort to address agricultural challenges to make the producer more efficient, develop better quality products, and maintain competitiveness in the world marketplace with reduced impact on the environment. Already, the private sector is investing heavily in biotechnology research, and in many instances is collaborating with ARS programs.

Mr. SKEEN. Does ARS evaluate whether or not each biotechnology project should or would be done by the private sector, if the federal government decided not to do the research?

Dr. FINNEY. ARS scientists refrain from performing research which can best be done in the private sector which is generally short range and low risk to meet their goals. Much of ARS research is long term and high risk and if ARS projects are developed to the stage of completion the ARS scientists follow through with those projects. In some cases, where it is expedient to solve a problem that is parallel to objectives of both the private sector and ARS, a CRADA is established.

COTTON BREEDING AT LAS CRUCES

Mr. SKEEN. Would you provide for the record the interest and need for ARS to establish a cotton breeder, support, and staff to be located at New Mexico State University at the USDA/ARS Southwest Cotton Ginning Research Lab?

Dr. FINNEY. ARS currently maintains cotton genetics research programs at several locations throughout the Cotton Belt. These programs address the high-priority needs of cotton producers and the cotton industry nationally, including insect resistance, fiber quality, yield, and other important characteristics. ARS does not see a need to initiate a program at Las Cruces.

Mr. SKEEN. What would the cost to ARS be for this purpose?

Dr. FINNEY. A plant genetics program with one scientist and full staff plus operational support requires an appropriation of \$300,000 per year.

Mr. SKEEN. Have the cotton breeding needs of Acala 1517 cotton in New Mexico and Texas been neglected?

Dr. FINNEY. The needs of New Mexico and West Texas cotton, including Acala 1517, have not been neglected, even though ARS has no genetics research at Las Cruces. Our cotton research programs are national in scope, producing advances that benefit all regions including New Mexico and West Texas. Some examples of recent ARS developments or discoveries that benefit this region include greatly improved heat tolerance and yield of Pima cotton, improved pink bollworm management to minimize spraying for this destructive insect, and increased yield linked to more efficient use of irrigation water.

EL RENO, OKLAHOMA

Mr. SKEEN. I understand that the ARS research facility in El Reno, Oklahoma, is scheduled to be closed this year. Because the wool and mohair program is scheduled to be phased out in the next three years, there is additional pressure on the sheep industry to

make its operations even more efficient. Since this is one of the few facilities in the country that does research on sheep, the consequences of this action could have a significant impact on the economy of the Southwest region of the United States. Will this facility be terminated this year?

Dr. FINNEY. Closure of the Grazinglands Research Laboratory in El Reno, Oklahoma, is a part of the Department's plan to finance higher priority research. Consequently, funds are not proposed in the FY 1995 budget for operation of the location.

Mr. SKEEN. If so, by whom and where will this vital research be conducted?

Dr. FINNEY. The Agricultural Research Service conducts sheep production efficiency research in three projects at the El Reno location. One project relates to physiology of nutrition and reproduction, which is studied in far greater depth in a number of ARS programs around the country, including primarily, Dubois, Idaho; Bozeman, Montana; Clay Center, Nebraska; and Beltsville, Maryland. The remaining two projects at El Reno relate to production of sheep grazing warm-season perennial pastures and winter wheat pasture. Similar work is underway using rangeland grasses at Las Cruces, New Mexico; Dubois, Idaho; Cheyenne, Wyoming; and Moscow, Idaho. Similar new work is underway using cool-season perennial grasses at Booneville, Arkansas, and Beckley, West Virginia. There is no alternative plan to continue sheep production research specifically using warm-season perennial grasses and wheat pasture.

Mr. SKEEN. Mr. Chairman, I ask unanimous consent that two questions offered by Congressman Larry Combest be put in the record and offered to the representatives here of the ARS.

Mr. DURBIN. Without objection, they will be added.

[The information follows:]

WATER CONSERVATION AND PLANT STRESS RESEARCH

Mr. COMBEST. Is water conservation and plant stress research and the need for this facility [at Lubbock, Texas] considered a high priority for the agency? Will the proposed research at Lubbock benefit other regions of the country?

Response. Yes, both water conservation and plant stress research in arid and semi-arid regions continue to be high priorities for the agency. Climate extremes, especially water shortage and high and low temperatures, occur in crop production areas through the U.S. and the world. Studies in the U.S. have shown that average yields of the major crops are three-to seven-fold lower under environmental stress compared to record yields. Basic information obtained at Lubbock in the Great Plains will benefit other regions of the world. We also recognize that existing facilities at Lubbock are not fully adequate. Renovation of our existing research facilities is the highest priority for agency construction funding.

Mr. COMBEST. Provide for the record the construction funding level request for the Plant Stress and Water Conservation Laboratory in the original ARS budget proposal which was submitted for inclusion in the USDA Fiscal Year 1995 budget proposal.

Response. ARS originally requested \$11,000,000 to fully construct this facility.

Mr. SKEEN. Thank you very much for your responses, and I always enjoy being with you. Thank you for the products that you bring to us every year. It's always enlightening to see the progress of your work, and it is also very nutritious, so you sustain us from one year to the next.

[Laughter.]

Dr. FINNEY. Thank you.

Mr. DURBIN. Thanks, Mr. Skeen. I hope Mr. Thornton will forgive me if I don't follow ordinary seniority, and instead give as part of our birthday gift to our colleague, Rosa DeLauro, the opportunity to ask questions.

Mr. SKEEN. Happy birthday, Rosa.

Ms. DELAURO. Thank you for reminding me, Mr. Chairman.

[Laughter.]

Ms. DELAURO. Let me say that I also want to applaud the research efforts of the ARS and the excellent work that is being done, and has been done on health issues including the moderate alcohol consumption and its relationship to hormone levels and breast cancer and the work that you've done with folic acid on heart disease.

HUMAN NUTRITION RESEARCH

What I wanted to do, and to pick up on both the Chairman's questions and Mr. Skeen's questions, is to ask you, how much or what is involved in selecting the agenda for human nutrition research. How do you go about selecting the research projects in this area? What's the process?

HUMAN NUTRITION PROGRAMS

Dr. FINNEY. We have a national program staff leader who works with our advisory groups on human nutrition. There is an advisory group for human nutrition program within the Department of Agriculture.

So we work with that group and its leadership. We also have five human nutrition center directors who meet periodically to review the status of the nutrition programs nationwide, also to decide which are the primary issues that are of concern in human nutrition in which the Department of Agriculture should be addressing.

So that's the process that we use to identify the major issues of concern and how we should allocate our resources for the human nutrition programs.

Ms. DELAURO. And do you work with any other Federal agencies in looking at the areas, for instance whether you're dealing with breast cancer.

Dr. FINNEY. We have representation on many interagency groups that enable us to keep up with research programs that influence nutrition across the government and within the land-grant system of universities.

Ms. DELAURO. And alcohol consumption. Is that done in conjunction with NIH?

HUMAN NUTRITION COOPERATION

Dr. FINNEY. We have very close collaboration with the National Institutes of Health. In fact, we exchange program planning activities. We have some funds that come to us from NIH to support us in the area of human nutrition research, particularly as it relates to human studies including one alcohol study. We also work cooperatively with the National Cancer Institute to identify food components that may be protective and to determine their bioavailability.

HUMAN NUTRITION RESEARCH AT BELTSVILLE

We have a human study facility at Beltsville, and they are very much concerned about dietary patterns as they relate to various types of chronic diseases—cancer, cardiovascular diseases—so we have to work with the National Institutes of Health in terms of the disease aspects because that's their mission, but we have very close cooperation with that particular institute nationwide as we focus on prevention.

HUMAN NUTRITION RESEARCH CENTERS

Ms. DELAURO. And the five centers are around the nation and gather input from the particular area of the country that they—

Dr. FINNEY. Depending on the mission of those centers and their link to of course NIH programs, as well as with the medical facilities close by.

For example, the Tufts facility which deals with the aging process is in very close collaboration with the medical school very close by. The program at Beltsville, of course, links up not only with the NIH but the Johns Hopkins Medical Centers and other local universities.

So those types of activities, communications, and coordination are very important to us in terms of making those types of decisions.

Ms. DELAURO. Is there any way—maybe I overlooked it—if you can just let us know where there is information about the centers and what they are focusing their time and attention on?

Dr. FINNEY. Yes. The type of research carried out at each of the ARS Human Nutrition Centers can be provided for the record.

[The information follows:]

HUMAN NUTRITION RESEARCH CENTERS

At the Beltsville Human Nutrition Research Center, Beltsville, Maryland, the role of foods and components in foods in optimizing health and reducing the risk of nutrition related chronic disorders, such as coronary heart disease, cancer and non-insulin dependent diabetes is studied in diverse groups of volunteers. Composition of foods, bioavailability of food nutrients and exploration for new nutrients are ongoing projects to provide nutrient databases. Energy metabolism and energy requirements for weight maintenance, human requirements and metabolic roles for carbohydrates and dietary fibers and mineral and vitamin interactions are major research topics.

Grant Forks Human Nutrition Research Center, Grand Forks, North Dakota, scientists study nutritional requirements for zinc, magnesium, boron, copper, and other trace elements and their relationship to optimal health, function, and performance. Physiological and biochemical factors and food sources that influence trace element requirements are studied in all age groups. Biological availability of minerals as affected by other components of the diet is studied using advanced measuring techniques.

At the Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, we exam nutritional requirements of the elderly for optimal health, function, and performance. The relationship of nutrition to the aging process and the role of diet in the prevention of chronic degenerative conditions are studied in volunteers to advanced ages. The role of diet in bone health, prevention of cataracts, immune response, interrelationships of exercise and diet on body composition, and requirements and tolerances of the elderly for folacin, vitamin B-12, vitamin A, vitamin B-6, and vitamin K, and antioxidant nutrients are other topics of research.

Children's Nutrition Research Center at Baylor College of Medicine, Houston, Texas, scientists explore nutrient requirements of infants, children, and pregnant, and lactating women. The role of diet for optimum growth and physical and mental development is the main theme. Specifically, the use of stable nonradioactive isotopes as markers in studies related to energy, protein, fatty acid, carbohydrate, iron,

and calcium requirements for growth of young infants and improved lactation in women, and nutritional needs of pregnant teenagers are major current efforts.

The Western Human Nutrition Research Center, San Francisco, California, has the responsibility to develop reliable, efficient, and inexpensive methods for defining nutritional status. This includes effects of marginal nutrient levels on performance and immune function; development of nutritional criteria for evaluation of intervention programs, and human nutritional requirements, including omega-3 fatty acids, vitamin C, folacin, and molybdenum.

Ms. DeLAURO. And with what resources?

Mr. FINNEY. The fiscal year 1995 budget for the ARS Human Nutrition Research Program is \$54.5 million.

[Additional information follows:]

Center	Fiscal year—		
	1993	1994	1995
Beltsville Human Nutrition Research Center, Beltsville, MD	\$9,227,900	\$9,382,800	\$12,972,600
Grand Forks Human Nutrition Research Center, Grand Forks, ND	8,071,300	8,141,200	8,219,100
Human Nutrition Research Center on Aging at Tufts University, Boston, MA	14,568,100	14,575,800	14,584,700
Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX	10,268,500	10,709,100	10,720,100
Western Human Nutrition Research Center, San Francisco, CA	5,114,600	5,159,300	5,208,600
Other Locations	2,474,700	2,744,400	2,770,900
Total	49,725,100	50,712,600	54,476,000

SALMONELLA

Ms. DeLAURO. I notice also in the request for your funding research initiatives that you talk about food safety, pest control, and wetlands.

I would like to ask a couple of questions in this area that reflect serious concerns in my State of Connecticut. Connecticut produces about 1 billion eggs per year. The contamination with salmonella bacteria is a serious problem for shippers, and for consumers of eggs.

Connecticut has a voluntary program of testing and inspection in conjunction with the laboratories at the University of Connecticut. We know how to control or prevent salmonella contamination, but is there any systematic research that is being looked into about the regular application of techniques, and whether or not the Federal Government should have some sort of a role in this effort so that we're looking at general techniques in these areas?

Dr. FINNEY. We have an extensive program, Ms. DeLauro, on the salmonella problem as it relates to poultry and eggs that is centered at a number of locations. One, of course, is at our laboratory at Athens, Georgia where they are looking at primarily the immune systems in chickens and which ones predispose them to salmonella.

We have a program at College Station, Texas where they are concerned primarily with what types of systems and management approaches can be used to suppress salmonella. It's called a process of competitive exclusion—that is if you provide the egg with a sugar solution, or incorporate that in the diet, it suppresses the growth of the salmonella organism.

So the Agency has a substantial interest and investment in that in a number of locations, and we're doing that in a systematic way in our overall food safety program.

PESTICIDE REDUCTION

Ms. DELAURO. Another area is pesticide reduction—a very, very serious issue for Connecticut, especially since we've got farmers in the State and suburban people living side-by-side. This is of real concern, become a lot of agricultural activity takes place near the Long Island Sound.

So again, at the University of Connecticut, they're looking at an effective integrated pest management program, and the average reduction of pesticides through the use of this program is at about 30 percent.

Now, as I said, this work is being done at the University of Connecticut. I'm wondering if you're familiar with the work that's being done there, and if there is any attempt to coordinate these kinds of research, whether it is going on at the University of Connecticut, or in other areas, so that we are maximizing Federal dollars in this effort.

INTEGRATED PEST MANAGEMENT

Dr. FINNEY. Yes. The Department of Agriculture has an integrated pest management working group that was established about two years ago, and its purpose, of course, is to ensure that the programs within the Department of Agriculture and the various agencies are planned and coordinated in an effective manner to use the resources available.

The Cooperative State Research Service is the agency that works with our universities and our state agricultural experiment stations, and they maintain an inventory of the research that's going on in the universities, and that's where that enters into the picture in terms of what's going on at different locations so that it can be coordinated in an effective manner.

Ms. DELAURO. And ARS is getting this information out directly to farmers and to others who can put this to use. Is that part of your outreach?

Dr. FINNEY. We do that through our Extension Service, and of course, they will be with you in the morning, and they are represented on this working group within the Department.

Ms. DELAURO. Okay. I mentioned that my district borders on the Long Island Sound, and that kind of habitat along the coast is critical. It's environmentally important, but for us in Connecticut, it's economically important as well because it sustains a scallop and oyster business, a commercial business.

WETLANDS

Is the ARS doing any research on the restoration of wetlands which is specific to estuaries like the Long Island Sound?

The riparian habitat along the Sound is critical to seafood, the seafood and industry. Have you done any studies with regard to the regeneration of wetlands as they relate to agriculture?

I am especially interested in efforts to restore sea grass as a habitat for scallops.

Dr. FINNEY. We have an extensive program on water quality issues, and a part of that program relates to the wetlands issue and what you referred to as the riparian zone.

Ms. DELAURO. Right.

Dr. FINNEY. For example, at the Beltsville Agricultural Research Center, they have been working very closely with the University of Maryland on the Chesapeake Bay issue where there would be very similar problems that you would have in Connecticut.

Part of our efforts with the 1995 budget request would be a million dollars to re-emphasize and strengthen the programs that we have underway in terms of looking at the biodiversity, the wetlands issue in terms of coastal areas.

So we have a good program and we hope to strengthen it in 1995 through the initiatives that we have outlined.

Ms. DELAURO. Do you know if you specifically have any studies with regard to oysters or scallops or so forth that might be made available?

Dr. FINNEY. Not specifically with regard to those species.

Ms. DELAURO. Okay.

Dr. FINNEY. But we are concerned about the quality of the water, and of course, maintaining the diversity of those wetland areas.

NON-POINT SOURCE POLLUTION

Ms. DELAURO. The final question is on the non-point source pollution, obviously again is a very serious issue for us on the Long Island Sound. Has the ARS done any research regarding non-point source pollution along the coast of estuaries, specifically those on the Atlantic Coast? And if you do, could you make those available to me?

Dr. FINNEY. We would be pleased to provide that for the record. [The information follows:]

NON-POINT SOURCE POLLUTION

ARS has an extensive program on non-point source pollution. This work involves many research sites in various States, but does not include any work specifically along the Atlantic Coast in New England.

However, we have a group in Beltsville, Maryland, working on the contributions of agriculture to the Chesapeake Bay. Our Beltsville group has studied the effect of cropping practices on transport of water and nitrogen compounds through the soils to nearby water courses, and studied the subsurface hydrology to explain large differences in behavior from site to site. They have demonstrated the usefulness of new soil test procedures to reduce fertilizer use and thus the potential adverse effect on the water resource. Also at University Park, Pennsylvania, our scientists are studying the effect of management of pasture and crop lands on riparian areas and streams. Similar work is centered in the Coastal Plains of Georgia and Mississippi.

Many of the findings from our work can be transposed to the Atlantic Coast. However, we have not related these results directly to the fishing industry along the coast.

Dr. FINNEY. We have an extensive program on non-point source pollution and the major effort very close to Connecticut would be at our watershed center at University Park in Pennsylvania, but we have a number of programs around the country, and we'll enter that into the record for you.

Ms. DELAURO. Okay. Great. Thank you very, very much. Thank you, Mr. Chairman.

Mr. DURBIN. Thanks, Ms. DeLauro. Mr. Walsh.

Mr. WALSH. Thank you, Mr. Chairman, and thank you all for your testimony and for the fine work that you do. Also thank you for this bag of delights up here. I found last year, especially as we

got into longer and longer nights, that the food looked better and better in the bags. [Laughter.]

And interestingly the experimental hot sauce was a real big hit at home. Unfortunately there is no formula and you can't buy it on the market, so I don't know if we can get some more of that experimental hot sauce. It's good stuff, and it's fiery.

DAIRY RESEARCH

Our committee last year increased funding for dairy research, and in particular, its effect on the environment. There was about a \$200,000 increase for the program. I was just wondering if you would tell us where that research is being done, and what type of research is being done on dairy.

Dr. FINNEY. The increase that was provided in the 1994 budget is targeted for Madison, Wisconsin. As you know, the 1994 budget was somewhat delayed as a result of the recession package, so that money will be going to Madison in terms of emphasizing the management of dairy waste. That will be the major focus of what we have in mind for that particular increase.

Dr. Oltjen, did you have anything that you might want to add on that issue?

Dr. OLTJEN. Certainly the concern of dairy waste is a very big one, and we think Madison, Wisconsin is uniquely situated to give us some very good answers in that area. It is a big one and we are very hopeful for the research up there.

Mr. FINNEY. That's where we have our Dairy Forge Research Center, which is the major program we have in dairy.

EXTENDING THE GROWING SEASON

Mr. WALSH. I had an interesting conversation. I had Dean Call in my office from Cornell yesterday and we were talking about some of the research that they're doing. One of the things that they talked about was research that would extend the growing seasons of certain crops in the Northeast.

For example, he told me that by the end of this month—it's hard to believe because if you look out the window here, there is a lot of snow on the ground, and you can imagine what's on the ground in upstate New York—they will be having fresh spinach available to pick.

Apparently they plant it in the fall and as soon as there is enough sun, it sprouts and grows.

How does that research fit in with the sorts of research that you folks do? Is it complementary? Is it competitive—the idea of extending growing seasons?

Dr. FINNEY. Well, of course, it would be complementary types of efforts. The major activity that we would have underway to look at this type of issue would be searching our national germplasm research base to look at new sources of germplasm that would allow crops to be grown under extended growing seasons or shorter growing seasons.

Of course, the genetic basis for the maturity of a crop is in its germplasm, so this would be the type of activity that the Agricultural Research Service would be exploring through its genetic en-

hancement program, but they would be complementary, not duplicative.

WATER QUALITY RESEARCH

Mr. WALSH. I want to follow up on the question Ms. DeLauro asked about water quality. While her question related more to the sea, the Sound, and the Chesapeake Bay, I'm a little more concerned about fresh water, surface water, and lakes. What sort of research are you doing there in terms of protecting water quality vis-a-vis agriculture?

Dr. FINNEY. The Department has an extensive program on water quality research. Our aims primarily are to look at management systems—that is, how can we change the process of managing our cropping systems and our livestock systems to reduce either erosion, to reduce the runoff from manures and waste, and of course, to minimize the use of agricultural chemicals, either fertilizers or pesticides in terms of the management issue.

So the major focus of the programs in water quality in terms of our surface waters overall would be new management systems that would reduce those adverse impacts from management practices.

HERBICIDE IMPACT ON WATER QUALITY

Mr. WALSH. I noted in the handouts that it's been shown that certain ranch groups of herbicides pre-emergence as opposed to post-emergence herbicides, were found to not have a negative effect on water quality.

I think that's really an interesting and important perspective, especially where I come from where you have the Fingerlakes, a series of lakes, with high ridges in-between, lots of agriculture on those, and the Extension Service encouraging farmers to do no-till agriculture.

Is that being extended out, the differences in herbicides and their impact on water quality?

Dr. FINNEY. Well, the reference that you made, of course, is included in our explanatory notes.

Mr. WALSH. Right.

Dr. FINNEY. Under our natural resources or soil and water program, and as you are probably aware, this no-till tillage is an important practice in terms of reducing soil erosion.

Mr. WALSH. Yes.

Dr. FINNEY. And conserving moisture. The research that was reported here is that it is much better from the standpoint of environmental protection to use post-emergence herbicides rather than the pre-emergence herbicides.

This means that it can be applied in a manner only when it is necessary to control the weeds. It is also not exposed to the soil for a longer period of time, so that is an important development and recommendation that we can make to the farming community in terms of environmental quality overall.

But of course, the types of herbicides that are used are an important concern as well in terms of their persistence, so our research programs are designed to address those to minimize the adverse impact on the environment.

LOW BIRTHWEIGHT INFANTS

Mr. WALSH. Lastly, I was really fascinated by the research that is being done on low birthweight infants. As you know, we have a very serious problem in this country in most major cities especially, but now even some of the second-tier of cities have problems with infant mortality and low birthweight babies.

I am interested in finding out where this research is being done?

ARS CHILDREN'S NUTRITION RESEARCH CENTER

Dr. FINNEY. That research would be centered at our Children's Human Nutrition Research Center for infants and children at the Baylor University College of Medicine.

Mr. WALSH. I see.

Dr. FINNEY. Which is in Houston, Texas, and they of course are looking at the composition of the milk that babies consume as infants, and they have been able to find that there are some components in the mother's milk that is essential in terms of particular underweight babies, and so those recommendations are important in terms of formulation to advance the health and welfare of infants at a very critical stage of their development.

Mr. WALSH. Once those conclusions are drawn, and everyone accepts them, how is that then brought to the health care providers in terms of a systematic approach or adaptation of these techniques.

Dr. FINNEY. At this particular Human Nutrition Center in Houston, we have on-site a USDA extension person who provides the overall leadership for extending that information to the extension community, to all of the health care centers, and the physician located around the country, so it is done primarily through our extension outreach effort.

And of course, we put out information in published forms as well to that essential community.

Mr. WALSH. Is it safe to say that most health care communities, most health care agencies around the country are aware of this information and are implementing it, or is it too early yet?

Dr. FINNEY. Well, it is at an early stage right now, but as it is developed and we refine that development, it will be made known nationwide.

Mr. WALSH. And if I wanted to have someone from my community learn more about this, who would we contact?

Dr. Finney. It would be the Director of the ARS Children's Nutrition Research Center, Dr. Dennis Bier, which is located at Baylor University in Houston, Texas, or the Extension Nutrition Specialist, Dr. Karen Konselman, who is also located at the Center.

Mr. WALSH. Very good. Thank you, sir. No more questions.

Mr. DURBIN. Thanks, Mr. Walsh. Mr. Thornton.

CLOSURE OF POTATO RESEARCH LAB IN MINNESOTA

Mr. THORNTON. Thank you, Mr. Chairman. Dr. Finney, I'm concerned about the closure or planned closure of a potato research center laboratory in Minnesota. It does ongoing research in the field of storage and quality and sprout inhibitors for the United States potato producers in cooperation with perhaps a dozen uni-

versities in that area, and it effects the Midwest, Maine, and Washington State.

Do you have alternatives in mind? Are you going to stop the research or is it going to be continued in some other way? Or have I magnified the impact of the closure of that station?

Dr. FINNEY. Well, Mr. Thornton, of course there will be some impacts as a result of the closure. This laboratory has done some excellent work over the years in terms of recommendations for storing potatoes, to extend their life and maintain their quality.

The laboratory, of course, has worked with the potato industry in terms of processing technology, as well as sprout inhibitors.

NORTHERN CROPS LAB IN NORTH DAKOTA

Now, some of that work we would continue to do at other locations. For example, we do have another laboratory called the Northern Crops Laboratory in North Dakota, and they will be picking up some of the work as it relates to the sprout inhibitors activity, but we will not be able to continue all of the work.

So it would be necessary for the industry or the university or our collaborators to pick up some of the activities that we have going on there.

You can appreciate that in times of budget constraints, even though it is difficult, those decisions were made.

Mr. THORNTON. I do understand that, and of course, I wanted to show by my question my concern for broad geography. I'm not just interested in what goes on in Arkansas as some people have suggested. [Laughter.]

But I am concerned about what goes on in other states as well, and I hope that as you go into this, we will take steps to make sure that this very important research for this very important crop is not just laid aside without proper consideration of alternatives.

POTATO INDUSTRY

Dr. FINNEY. Yes. We do have an extensive program to support the potato industry at other locations as well, including work at Beltsville and in Maine, Wisconsin, and Washington but we will have to be looking at that balance to do the best that we can with the resources available to meet the most pressing needs of that industry.

Mr. THORNTON. Yes.

Dr. FINNEY. So we are sensitive to that.

RICE RESEARCH

Mr. THORNTON. And another project that is going on outside of Arkansas has to do with the germplasm research center, and there have been some efforts recently to associate that more closely with the center of rice production in this country, Stuttgart, Arkansas which is not in my district.

I'm trying to show that I do have an interest in agriculture from outside my own personal district, as well. [Laughter.]

But this rice research is very important, and the germplasm research is very important, especially as we undertake to grow new strains of rice which may be more palatable to Japan and other

countries in the Far East where they prefer a different rice structure. Can you comment on that?

Dr. FINNEY. Well, of course, Mr. Thornton, you are probably quite aware that the Department of Agriculture has a substantial investment in its genetic resources program, germplasm systems, and repositories. We do extensive collections overseas to seek new germplasm that would be important to American agriculture.

Mr. THORNTON. Yes.

RICE GERMPLASM

Dr. FINNEY. We have appointed a new director for the rice germplasm program in Arkansas, Dr. Neil Rutger.

Mr. THORNTON. Yes.

Dr. FINNEY. Who is internationally known.

Mr. THORNTON. A splendid choice.

Dr. FINNEY. Who had an extensive program at California for rice improvement before coming there, so we are very confident that based on his international connections—he understands the program at the international centers that support the rice industry very well—so we are very confident that he is going to provide the leadership to make that program in Arkansas one of the best programs not only in the United States, but in the world.

RESEARCH RELATED TO NUTRITION

Mr. THORNTON. Sounds mighty good. With regard to similar types of research related more to the effect of nutrition which is where I'm heading, there are some studies that are proposed to bring together medical doctors and plant researchers to genetically improve by breeding and other methods fruits and vegetables, carrots, beta carotene, others that may inhibit cancer, instead of just trying to find causal relationships, moving towards the oxygenation—I had a little trouble with the word—putting extra oxygen into the system so that cancer is inhibited.

Dr. FINNEY. Yes.

Mr. THORNTON. Do you have any comments on that?

Dr. FINNEY. Yes. This is a very important area of research. You mentioned rice.

Mr. THORNTON. Yes.

ENHANCED PROTEIN CONTENT OF RICE

Dr. FINNEY. There was a project at Beltsville in the plant molecular biology laboratory by a scientist who was looking at enhancing the protein content of rice through a genetic engineered process, and he was able to demonstrate that you could do that, and that's now being incorporated into the germplasm that would go into new varieties.

Mr. THORNTON. Good.

CAROTENOIDS, LYCOPENE AND TOMATOES

Dr. FINNEY. There is work going on in terms of looking at the carotenoids and the lycopene in tomatoes. We like red tomatoes but the nutrition community tells us that the yellow tomatoes are bet-

ter for us in terms of having the appropriate constituents that would inhibit cancer.

So that's a very important initiative within the Agricultural Research Service, and we are pursuing that very aggressively with our plant scientists as well as our human nutrition community, and there are very good links between the nutrition centers and our production research people in that regard. It's a very important initiative.

ARKANSAS CHILDREN'S HOSPITAL

Mr. THORNTON. One of the things that I've been concerned about is trying to develop cooperative agreements and actual working models, not just rhetoric like—oh yes, we're going to cooperate—but some initiatives which pull together the resources of the Environmental Protection Agency and the Food and Drug Administration, and Agriculture and apply them to the areas of human nutrition, early childhood development, the problems of food, and the good results that can be obtained from proper nutrition of pregnant women and of children.

In the Arkansas Delta this is really a major problem. Are you making any steps in that direction? I'm thinking of the great resources of the Arkansas Children's Hospital in connection with this.

Dr. FINNEY. Well, Mr. Thornton, we have had some very important discussions with the officials of the Arkansas Children's Hospital in terms of the expertise and their capabilities and interest. We have had two visits with the staff there during the past few months, and we are very encouraged that with that capability in Arkansas we would be able to develop some new relationships and some cooperative efforts that would strengthen our nutrition program overall.

So it is an important program and we appreciate very much the interest of that center and that facility in this area.

Mr. THORNTON. Let me just make a comment for the record, that this institution in Arkansas is generally considered to be one of the top four or five in the whole United States, and the best in areas where the constituency is rural.

Recently a child requiring a major medical treatment involving the substitution for a heart/lung machine for a period of time, was transported to the Children's Hospital by air from New Jersey with equipment furnished by the Children's Hospital which has developed the only such mobile equipment in the world.

It is really a razor's edge institution in terms of its relationship with the University of Arkansas for Medical Sciences, and children's health issues, and I hope that it will not be overlooked as you move forward in this area.

Dr. FINNEY. Yes. We intend to pursue that very aggressively.

Mr. THORNTON. Thank you. Mr. Chairman, yield back.

Mr. DURBIN. Thank you very much. Mr. Pastor.

Mr. PASTOR. Good morning, Mr. Chairman.

Mr. DURBIN. Good morning.

Mr. PASTOR. First of all, I would extend happy birthday greetings to my colleague, Ms. DeLauro. I was disappointed in her testimony. She said that in Connecticut they lay 1 million eggs.

Ms. DELAURO. It's actually a billion eggs.

Mr. PASTOR. Oh, is it a billion eggs? Oh, okay.

Ms. DELAURO. It's a billion eggs. [Laughter.]

Mr. PASTOR. Because I was going to tell her that here in Congress in a good session, we lay at least 2 billion eggs. [Laughter.]

FOOD SAFETY

Mr. PASTOR. My line of questioning deals with food safety and how we test for contaminants. Dr. Plowman says in his testimony that the ARS lab in Clay Center, Nebraska had developed a rapid test that can assess the presence of microbial contaminants on carcasses. And, Dr. Finney tells me that ARS scientists are optimistic the rapid diagnostic assays will be developed in the near future to begin testing for bacterial contaminations of meat in commercial slaughter plants.

Secretary Espy last week told us that there was going to be a breakthrough but that he couldn't announce it. And, I'm assuming that this is what you're announcing today.

What I'd like to know is what is the test or tests? How rapid are they? And then, how soon will you be able to train your people to use this test in the field and actually conduct rapid testing?

RAPID TEST FOR BACTERIAL CONTAMINATION

Dr. FINNEY. Mr. Pastor, the Agricultural Research scientists at Clay Center, Nebraska indeed have been working on what they refer to as their rapid test for bacterial contamination on meat products.

This is a test that's been adapted from the pharmaceutical industry. It is a rapid test in that it can be used in about, less than an hour. I think the last briefing that I had was about 50 minutes to actually carry out this test.

The test involves measuring microbial adenosine triphosphate (referred to as ATP) which is a form of storage energy in all cells, and it's used to determine the level of bacteria on the carcass.

Mr. PASTOR. Now, the level of bacteria or types of bacteria?

Dr. FINNEY. The level of bacteria.

Mr. PASTOR. The level of bacteria.

Dr. FINNEY. Yes, and the idea would be to be able to look at a carcass to determine if the level of bacteria exceeds a certain concentration, and if you determine that then that would be a suspect carcass which means you would want to pull that carcass aside and do additional evaluations before making a decision as to whether or not it should move through the processing line or the slaughter plant.

So that's the rapid test that is being worked on at Clay Center. We have had some evaluations of this particular rapid assay through a protocol that was jointly developed between ARS and the Food Safety Inspection Service staff.

Those tests should be completed this week and we hope to have some analysis that we can look at next week in terms of how well it meets the needs of the inspectors on a practical basis, and I think that's the key right now, is to see how well it works on an inspection line because things work in the laboratory and some-

times you find problems when you take them into the processing plant.

E. COLI

So that's the rapid test that is referred to, but we do have other work going on at other locations. For example, at our food safety laboratory in Philadelphia where we have our Eastern Regional Research Center. They are also involved in developing tests specifically for the E. coli organism as well as at our National Animal Disease Center in Ames, Iowa.

So we have a series of activities going on to try to get a handle on something that could be very appropriate and specific for this particular challenge.

Mr. PASTOR. How far have you come in the development of rapid testing for E. coli or in being able to identify the type of bacterial contamination that is present?

STATUS OF RAPID TEST

Dr. FINNEY. We have some laboratory work that looks promising, but it would be premature for me to predict when that would be ready to go into a test in a processing line, per se.

This is a very difficult issue because I think, as I listen to some questions and discussions from when the Secretary was here, Mr. Thornton pointed out that there are thousands of E. coli. Some are very beneficial and essential, and so the ones that we are concerned about is maybe one or two out of a thousand.

Mr. PASTOR. Right.

Dr. FINNEY. So it's a real challenge to target that particular strain or biotype.

Mr. PASTOR. I've been told that ARS can meet those challenges, so that's why I bring it up.

Dr. FINNEY. I can assure you that we will.

Mr. PASTOR. Oh, good.

Dr. FINNEY. It's just a matter of how long it's going to take, and that's what you're asking me. [Laughter.]

Mr. PASTOR. That's right. Even a ballpark figure, because we have an interest in this. And, I would encourage you to continue the research so we can develop a reliable test as quickly as possible.

Dr. FINNEY. Well, absolutely, Mr. Pastor, and that's the thrust of what we're putting forth in our budget process.

You know, we talked about closing ARS facilities. That's not a decision that's made lightly. It's made because the Secretary and the Administration and the public are saying that there are some big problems that we need to put more resources into.

And so that's what we are emphasizing, those things that we need to put more resources into, get the very best minds to address this critical issue.

Mr. PASTOR. I have been told by the private sector, especially those that deal with fast foods, etc., that there is a technology to detect the bacterial contamination on some of the processed meats.

Now, have you been working in conjunction with some in the private sector? Or, what kind of cooperation do you have with the private sector?

Dr. FINNEY. Yes.

Mr. PASTOR. In terms of their research and your research.

Dr. FINNEY. The area of food safety and this pathogen issue is one that the Department probably puts more effort into in terms of coordination, in terms of communications, in terms of planning, in terms of working with the university community, in terms of trying to identify what the industry itself is doing, and ensuring that we are working together and not duplicating effort. We are coordinating it to address it in a most effective way.

So we are very much aware that not only are we investing, but the industry is also investing to try to develop this rapid technology, so we have working groups that meet periodically. We have an annual review where we invite industry and universities in to discuss these issues.

So it is a very, very important issue and a lot of effort goes into the planning and coordinating.

I want to assure the committee that we are putting forth the efforts that are required to address this important issue.

SWEET POTATO WHITEFLY

Mr. PASTOR. Last year ARS was very kind in allowing research money to go to the research on the whitefly. As you know, we had great problems in Arizona.

Dr. FINNEY. Yes.

Mr. PASTOR. And so I want to thank you, and applaud you for taking on that issue. Yesterday I was with the Agricultural Director from Arizona and it seems that your research helped, and is helping eradicate that pest. But, obviously we still need further research on it. So, I thank you for using your discretion and allowing us to continue to benefit from those research funds.

It helps our Arizona farmers from cotton to cantaloupe growers. If the whitefly attacks one particular product, we can keep it from spreading to its other natural hosts.

Dr. FINNEY. Thank you, sir.

MARICOPA, ARIZONA

Mr. PASTOR. In last year's language, we had talked about consolidating the research lab in Phoenix, located on Baseline Street, with the one you have in Maricopa, the Big Mac. Yet, we didn't see it in the President's budget. We recently wrote a letter, Senator DeConcini and myself, to Secretary Espy inquiring about this issue. What do you see happening with that facility because I know that ARS had an interest in consolidating the research in one particular area and supported moving to Big Mac?

Dr. FINNEY. Mr. Pastor, we are still very much interested in that on a long-range basis. The budget that we have for 1995 requests almost \$26 million for facilities. After the process moved through the agency and the Department and OMB, there were not adequate resources for us to pursue at this time that particular facility at that location, but it is still one that is of interest to us from the standpoint of our long-term needs.

Mr. PASTOR. So there is still a chance to generate greater interest.

Dr. FINNEY. Yes, sir.

PECAN RESEARCH

Mr. PASTOR. Pecans represent an important source of jobs and income for the State of Arizona. For this crop to retain the qualities that enhance its ability to compete domestically and abroad, it is critical for us to continue to improve our pecan germplasm and expand our breeding efforts. I have noted that the President's budget has not included funds to continue the pecan genetics and breeding program headquartered at the W. R. Poage Pecan Field Station in Brownwood, Texas.

What initiative will enable the agency to continue the pecan breeding and genetics work presently conducted at the W. R. Poage Pecan Field Station located in Brownwood, Texas?

Dr. FINNEY. ARS will continue its pecan genetics and breeding program in the Fruit and Tree Nut Research Unit, Byron, Georgia. The objectives of this program include development of rootstocks and scion germplasm adapted to the Southeastern United States with improved disease and pest resistance, early ripening, and stable yield. The results of this research are expected to be broadly applicable in all pecan-growing regions in the U.S. ARS will continue to maintain at Brownwood, Texas, the pecan and hickory germplasm currently being grown there as a public resource for ARS, State, and industry pecan improvement programs.

Mr. PASTOR. Thank you.

Dr. FINNEY. Thank you.

Mr. PASTOR. To my colleague, Congressman Walsh, we too don't like New York salsa and I will bring you some from Arizona so you won't have to wait on ARS. [Laughter.]

Mr. DURBIN. Mr. Smith.

END-USE QUALITY RESEARCH ON POTATOES

Mr. SMITH. As a follow-on for Mr. Thornton's question, are you going to do end-use quality research anywhere else now if you close down the one in North Dakota?

Dr. FINNEY. On potatoes?

Mr. SMITH. Yes.

Dr. FINNEY. We have no plans at this time to pursue the end-use quality as it relates to potatoes.

Mr. SMITH. So there wouldn't be any research done anywhere else?

Dr. FINNEY. I don't believe so. We did have some work at one time at the Eastern Regional Research Center on end-use of potatoes but that was closed out some time ago, and I don't believe we have any work going on out at the Western Regional Research Center which is also one of these utilization centers, but I don't think it relates to potatoes.

Mr. SMITH. Well—

Dr. FINNEY. Let me inquire of our potato expert.

Mr. PLOWMAN. Dr. Brooks, do we have any other end-use?

Mr. BROOKS. We do not.

Dr. FINNEY. The answer is that we do not, and we would not be able to pursue that at this time.

Mr. SMITH. And this likewise is not a parochial thing because Iowa State University is no longer in my district, but they do a little part of this, but isn't end-use quality an important thing?

Dr. FINNEY. Yes, it is, and we would have to look toward the industry investments to address that issue through the private sector, and perhaps through some of the university resources.

Mr. SMITH. Well, when you say the industry, who in the industry, and how do they put it together?

Dr. FINNEY. Well, perhaps the only way I could see that occurring is through some of the commissions that represent the industry overall. That would be the only avenue that I would see, Mr. Smith.

It's a difficult problem. There is no question about that.

Mr. SMITH. You see, the growers that will gain from this type of research aren't even in existence. I mean they are children out there somewhere. The ones that are in the business today aren't the ones who are going to benefit. This has always been the case with ARS research.

I mean, you have to do research for the generation ahead, isn't that so?

Dr. FINNEY. That is the strategy that we have used for making decisions in the past, yes.

SWINE RESEARCH FACILITY

Mr. SMITH. Do you have a detailed breakdown on the numbers of dollars that each component of the swine research facility will need this year, next year, and the year after?

In other words, we know the overall amount of dollars. We don't know at this time what you will need the exact number of dollars. Do you have that or can you provide that information for the record?

Dr. FINNEY. We can provide that for the record, Mr. Smith.

Mr. SMITH. Okay. I understand that for the central building they have to have all of that funding in one lump sum, and then after that, the remaining components could be divided into separate funding amounts.

Dr. FINNEY. That's true.

Mr. SMITH. I would like to have those exact figures, if we can get those.

Dr. FINNEY. I believe to complete central laboratory office complex, the figure would be \$6.5 million.

Mr. SMITH. I see. And that amount has to be in one sum, and after that well then, it is a matter of—

Dr. FINNEY. Right.

Mr. SMITH. It's not as critical.

Dr. FINNEY. That's correct. We will provide that for the record accurately.

Mr. SMITH. All right.

Dr. FINNEY. But that's my estimate—\$6.5 million.

[The information follows:]

NATIONAL SWINE RESEARCH CENTER

AMES, IOWA

The National Swine Research Center will consist of a 52,000 square foot Laboratory/Office Building which will include laboratories, offices, library, conference room, and other support space. The Center will also include at another location a 110,300 square foot swine farm production facility with support buildings. Total cost is \$25.9 million.

The site of the new office/laboratory building is on Iowa State University (ISU) land adjacent to the National Soil Tilth Laboratory (NSTL). ARS will enter into a separate long-term lease agreement with ISU for that portion of the 700-acre farm complex in Boone County which will be used to construct the farm complex research facilities.

In FY 1992, \$1,800,000 was appropriated for planning and design. In FY 1993 an additional \$1,524,000 was appropriated for planning and construction. In FY 1994, \$4,524,000 was appropriated for construction. A contract for site selection and Environmental Assessment was awarded in the second quarter of FY 1992. A pre-design contract was awarded in the first quarter of FY 1993. The design for Phase I office/lab will be completed in the fourth quarter of FY 1994. The design contract for Phase II Farm Complex is anticipated in the fourth quarter of FY 1994.

The Farm Complex design schedule has been delayed due to complex environmental assessment issues and the coordination of planning activities with numerous industry, university, and other local officials.

An additional \$6.5 million will be required for construction in FY 1995 for Phase I office/lab. Phase II Farm Complex construction is \$11.6 million. This will be required in FY 1996.

KIEV, UKRAINE

Mr. SMITH. I have another questions that is a little different. I have been to the research farm in Kiev several times. They have done some great research there.

As a matter of fact, the biggest sheep I've ever seen in my life I saw at Kiev in the Ukraine. I have never seen anything in the United States to match them, and what I'm wondering is as a fall-out of what's going on in the former Soviet Union and the break-up, are we getting some benefit out of some of their research? Are we being able to exploit that like we have been in some other fields?

Dr. FINNEY. Dr. Plowman is very much interested in this area, and he might want to share with you a perspective on that.

Mr. SMITH. Okay.

Dr. PLOWMAN. Well, since the break-up of the former Soviet Union, we've sent a few teams over there to some of their major research laboratories to see what they've got and look at some programs that both of us might benefit from.

And it is true, they've got a number of things, and that's one of them.

Mr. SMITH. Especially for northern climates.

Dr. PLOWMAN. Right.

Mr. SMITH. Yes.

Dr. PLOWMAN. They've got some very interesting germplasm over there on a number of crops that we could greatly benefit from.

And they are poor. Since their system collapsed, they don't have resources to do anything. What we badly need, and I haven't figured a way to do it, is provide a little seed money that would, link up our people with some of their major research laboratories.

Mr. SMITH. Have you got that in your budget request.

Dr. PLOWMAN. We don't have.

Mr. SMITH. When you talk about a little——

Dr. PLOWMAN. We relied——

Mr. SMITH. What are you talking about?

Dr. PLOWMAN. We relied in the past on OICD to provide money that would facilitate that, and they are being absorbed into FAS, and I'm not familiar with their budget.

Mr. SMITH. When you talk about a little money, are you talking about thousands of dollars or millions of dollars?

Dr. PLOWMAN. I believe if we had two million dollars, it would be quite adequate to start that process. I think it would be of great benefit for both our country and the former Soviet Union.

Mr. SMITH. Now, the first time I was there was in 1960, as a matter of fact, and for some strange reason which our embassy never did know, they let me see things they said they had never let foreigners see before.

I guess it had something to do with Krushchev's visit to the United States. I had been cooperative.

Mr. DURBIN. You have an honest face.

Mr. SMITH. Pardon?

Mr. DURBIN. You have an honest face.

Mr. SMITH. Yes, Okay. [Laughter.]

But they were very secretive about a lot of this. Is that true anymore, or are they open now?

Dr. PLOWMAN. No, it's not true anymore. The attitude over there couldn't be better. They will share almost anything with us. We've not encountered any reluctance on their part to share their technology or anything else.

Mr. SMITH. Especially for the northern climates of the United States, it seems to me that this might be a very, very cheap way to get some very valuable research that took years and years to accumulate.

Dr. PLOWMAN. That's true. We would certainly agree with that.

Mr. SMITH. Yes, okay. Thank you.

Mr. DURBIN. Thank you very much.

Dr. FINNEY. I believe Dr. Oltjen had something to say.

Dr. OLTJEN. Mr. Chairman.

Mr. DURBIN. Yes.

Dr. OLTJEN. I would like to——

Dr. FINNEY. It stimulated his interest, so he may have something to add to that question.

Dr. OLTJEN. I would like to comment on that also. Thanks, Essex.

AMERICAN SHEEP INDUSTRY

The American sheep industry, as one of their highest priorities, is having access to the extensive germplasm in the former Soviet Union. They indicated that it would be great to have a team go over and see what there was.

A three-man team went over there approximately a year ago and came back with a great deal of new information, and we're going to be reviewing the possibilities of getting some of that germplasm in this country, and to determine what utility it might have in the northern climates, as you suggest.

Mr. SMITH. I'm glad to hear that. Of course, we had Columbia sheep which are the big sheep in this country.

Dr. OLTJEN. Yes, right.

Mr. SMITH. Combination sheep, but those sheep I saw were as big as calves. They really were.

Dr. OLTJEN. We are pursuing that.

Mr. SMITH. I think they had more wool on them than Columbia sheep do, I really do.

Dr. OLTJEN. It's a golden area over there for exploration right now.

Mr. SMITH. Yes. Okay, thank you.

BARD

Mr. DURBIN. If I could ask some questions on other issues. You are asking for an increase of \$2.5 million in support of the U.S./Israel Binational Ag Research and Development, known as BARD.

Dr. FINNEY. Yes.

Mr. DURBIN. I understood the mechanism of that research to be interest earned from a certain pool of money. Can you explain to me why this direct appropriation is being requested?

Dr. FINNEY. Dr. Plowman is very closely associated with that and a member of the board of directors, so he could perhaps give you some insight.

Dr. PLOWMAN. I would like to speak to that. The BARD program has been funded from the interest on a rather large endowment. However, since world interest rates have decreased, there has been less and less money generated.

As a result of less money earned through interest plus the cost of inflation, the program only buys about half of what it did 12 years ago.

Now, it's a very, very important program for Israel. Israel is a small country and they rely on the BARD grants for a substantial amount of research support.

As a result of this situation, the Israelis are willing to contribute \$2.5 million annually to support increased activity under BARD grants, if the U.S. would match that.

The money of course is not all spent in Israel. About half of it is spent in Israel, and about half of it is spent here.

Every one of those projects has to have a joint investigator—one from Israel and one from the U.S., so it is not like we're giving Israel money. Any money that we put in there would come back under a competitive grants basis to our researchers here. It would also bring us the technology that the Israeli scientists have.

So we are proposing a new way to match their \$2.5 million with \$2.5 million on this side, recognizing that the money would come back here to our scientists under a competitive grants program.

Mr. DURBIN. Can we anticipate this type of request in the future if interest rates stay low?

Dr. PLOWMAN. They are willing. They've made a commitment to put that in each year.

Mr. DURBIN. The Israelis.

Dr. PLOWMAN. If the money is appropriated, if our \$2.5 million is appropriated in this 1995 budget, it would become part of our base, and we would commit that to the BARD program, along with their \$2.5 million, but we wouldn't ask for it again. It would become part of our base and we'd do that.

Mr. DURBIN. I guess I missed what you said. I thought the argument was that the interest on the base was funding the program, and since interest rates had gone down, we needed to supplement the funding and Israel would match us.

Dr. PLOWMAN. That's correct.

Mr. DURBIN. Is that correct?

Dr. PLOWMAN. That is correct.

Mr. DURBIN. So next year if interest rates are low, we'll be asked for another \$2.5 million.

Dr. PLOWMAN. Well, that's correct. That's exactly correct.

Mr. DURBIN. And I think this is the first time that this committee has been asked to appropriate money for this purpose.

Dr. PLOWMAN. That's correct also.

POTATO LATE BLIGHT

Mr. DURBIN. Okay. Let me talk to you about potatoes which seem to be a pretty hot item this morning—someone told me the largest selling vegetable in America possibly.

Dr. PLOWMAN. It's true.

Mr. DURBIN. Considering all the french fries we eat. We were prevailed upon by Congresswoman Snowe and Senator Mitchell in the last supplemental disaster bill to provide, I believe, \$1.4 million for research into late blight, and they asked the subcommittee specifically to come to their aid because of this problem.

Can you tell me how much you are spending apart from that \$1.4 million in 1994 on late blight research?

Dr. FINNEY. You're referring specifically to the \$1.4 million that was appropriated in the supplemental.

Mr. DURBIN. Right.

Dr. FINNEY. That was appropriated to the Extension Service and they will be here tomorrow. It might be, with your permission, they could probably address that better than ARS.

Dr. PLOWMAN. But you are asking, Mr. Chairman, how much money we're already spending on late blight research?

Mr. DURBIN. Yes.

Dr. FINNEY. In ARS.

Dr. PLOWMAN. Okay. Somebody here has all the answers.

Dr. FINNEY. We're spending a total of \$439,000 specifically addressing late blight in potatoes, and it is at Beltsville, Maryland, Frederick, Maryland, and a small amount at Orono, Maine; Madison, Wisconsin; and Aberdeen, Idaho.

They are working together to look at our germplasm activities to breed for resistance to late blight, so the figure is \$439,000.

LATE BLIGHT POTATO RESEARCH

Mr. DURBIN. Please describe for the record the work you are doing in connection with late blight potato research.

[The information follows:]

Aberdeen, ID—Development of resistant or tolerant varieties, and characterization of the nature and genetics of resistance to late blight.

Beltsville, MD—Development of resistant germplasm and varieties by conventional plant breeding and biotechnology; determination of the ecology of the pathogen; determination of the mechanism(s) of resistance; and mapping of resistance genes.

Frederick, MD—Characterization of the virulence, pathogenicity, and genetics of different strains, races, and types of the pathogen; development of improved pathogen detection and identification methods; and development of methods to reduce the stability of the pathogen.

Madison, WI—Transfer of late blight-resistance genes from wild potato-related species into cultivated potato varieties using tissue culture and other biotechnological techniques to overcome natural barriers to gene transfer.

Orono, ME—Development of cropping systems and other cultural practices to reduce disease incidence.

Mr. DURBIN. What is the need for this research?

Dr. FINNEY. Potato late blight disease is in increasing problem in the United States. Decreased yields in the field and increased losses due to rotting in storage are expected to continue. The problem is exacerbated by the appearance of new types of the late blight fungus in the United States. These new types are more aggressive and more variable than the type that had been prevalent in the country until recently. Some of the new strains are also resistant to the fungicide most commonly used for diseases control.

Mr. DURBIN. For the record, please list by location the funding and staff for late blight potato research for fiscal years 1994 and 1995?

[The information follows:]

Location	Fiscal year 1994—		Fiscal year 1995—	
	Funds	Scientists	Funds	Scientists
Aberdeen, ID	\$39,300	0.1	\$39,700	0.1
Beltsville, MD	196,100	1.0	197,500	1.0
Frederick, MD	169,600	0.7	171,000	0.7
Madison, WI	2,000	0.1	2,100	0.1
Orono, ME	32,000	0.1	32,200	0.1
Total	439,000	2.0	442,500	2.0

TOBACCO RESEARCH

Mr. DURBIN. Okay. Let me make sure I understand your proposal to close 19 different laboratories. Would this include the closing of the tobacco research laboratories? I'm not sure which ones specifically are on the list, but is that correct?

Dr. FINNEY. That is correct.

Mr. DURBIN. Is this part of a policy decision by the Department or Administration?

Dr. FINNEY. Would you like for me to respond to that, Dr. Plowman? [Laughter.]

It is a part of our decision in terms of our facilities and our program priorities. It is a unique part of our national programs. I would not say it is part of a policy decision by the Department.

Mr. DURBIN. Try that again. [Laughter.]

Dr. FINNEY. It is not part of a policy decision of the Department.

Mr. DURBIN. Right. Is that research being transferred to another laboratory?

Dr. FINNEY. It is not.

Mr. DURBIN. Right. Will there be any research funded by ARS on tobacco either through CSRS or any ARS efforts otherwise?

Dr. FINNEY. If the proposed budget is approved as presented, ARS would not have funds committed to tobacco research.

Mr. DURBIN. How much has been committed, for example, in this fiscal year for tobacco research?

Dr. FINNEY. It's of the order of about \$3.7 million.

Mr. DURBIN. Right. I think you understand where I am on this issue. I think the record has reflected my position for ten years on this Subcommittee.

Dr. PLOWMAN. Mr. Chairman, remember our discussion last year. We talked about our research program in tobacco, and we talked about two components of it.

We were doing some in relation to models and the "white mouse" type of activity.

Mr. DURBIN. Exactly. That's where I was headed.

Dr. PLOWMAN. We've reclassified some of that research because it is really not tobacco research. And what we've proposed for termination is our total tobacco program. This is it.

Mr. DURBIN. All right. That was the question I was getting to.

Dr. PLOWMAN. That's correct.

Mr. DURBIN. In fiscal year 1995, you plan to close the two tobacco research laboratories and redirect funds for this research. Please describe your plans in detail.

Mr. FINNEY. Since most of the original research objectives relating to tobacco research have been accomplished and there are other production and marketing problems with other important economic crops that have a higher national priority, the tobacco research at Lexington, Kentucky; Oxford, North Carolina; and Beltsville, Maryland, is recommended for termination. Tobacco growers are diversifying their operations to other crops, and much of the research now being conducted by ARS scientists relates to local tobacco production problems that can be considered the responsibility of individual states. Dollar resources now allocated to these programs will be reinvested in fiscal year 1995 to finance higher priority research needs, including food safety and pesticide use reduction.

Mr. DURBIN. For the record, please list by location the budget for non-health related research for fiscal years 1993, 1994, and 1995? [The information follows:]

Location	Fiscal year—		
	1993 funds	1994 funds	1995 funds
Albany, CA	\$116,200	.....	.....
Beltsville, MD	434,800	\$441,700	.....
Lexington, KY	1,219,000	1,173,400	.....
Oxford, MS	1,622,700	1,648,100	.....
Total	3,392,700	3,263,200	.....

Dr. FINNEY. The FY 1994 total of \$3,263,200 reflects the amount that will be saved in FY 1995 by the termination of non-health related tobacco research. An additional savings of \$503,900 is proposed upon termination in FY 1994 funding for health related tobacco research that is not reflected in the table.

BREEDING PLANTS TO MEET NUTRITIONAL REQUIREMENTS

Mr. DURBIN. Let me talk about another issue that came before me yesterday which I think is interesting. It came from the State of Texas and some friends down at Texas A&M and other places.

They are suggesting that perhaps we should be doing some research on the establishment of nutritional requirements for things such as beta carotene or Vitamin A. Then, couple that nutritional research with an effort at plant breeding so that we can have selective breeding of carrots, for example, that are high in beta carotene.

Then, obviously this is leading to a marketing of that product, so that at some time in the future, American consumers going to the produce counter or buying canned goods, could find that there is a higher level of beta carotene in the produce that is being sold to them.

I am fascinated by this concept, but I think there are obviously some problems of jurisdiction here. Does the NIH have a role in this? Is this strictly an ARS nutrition question leading to an agricultural project to develop new plants and the like?

Can you comment on that? It seems to raise the more fundamental question as to whether we have a coordinated approach in the Federal Government when it comes to this type of nutritional research and where we draw the line between NIH and the U.S. Department of Agriculture.

Dr. FINNEY. Mr. Chairman, I believe that's within the realm of the responsibilities of USDA to identify the optimum requirements, dietary requirements for humans.

Of course, we do cooperate with NIH when it comes to a health issue where there is a disease involved, but in terms of beta carotene, that needs to be improved within the composition of many of our commodities.

We do have work underway at the current time to look for germplasm that has inherent high levels of beta carotene, of carotinoids, or other types of amino acids in the germplasm base, so this is work that's ongoing within the Department now between our human nutrition centers and our plant geneticists.

And of course, you can appreciate that over the years, animal breeding and genetics programs have emphasized reducing fat and improving lean composition within meat, so I think it's clear in my mind that USDA has a major responsibility in that area, and in fact, has made progress in that area.

But we recognize that you can always do better, and you can always have stronger links, and that's what we're working on.

NUTRITION LABELING

I might mention that in our budget request, we have made a request for some funding to improve our human nutrition composition activities for our nutrient composition materials in terms of developing new standards, new methods, that would enable us to more effectively label some of the products that go through the marketplace.

So I think those types of issues are entirely within the realm of USDA, and nutrition as it relates to the production needs of American agriculture to deliver a more nutritious product to the American consumer.

CARROTS AND BETA CAROTENE CONTENT

Mr. DURBIN. They brought up two interesting elements. First, they are going to be relying on traditional plant breeding techniques, so they will be skirting this whole genetic issue which we have to face head-on, but in this particular instance, does not appear to be applicable.

And secondly, they showed me some analyses of carrots and the beta carotene content, and they were dramatically different.

Dr. FINNEY. Yes, sir.

Mr. DURBIN. They showed different types of carrots and what they would produce or would the consumers use. They went on to say that some analysis of the carrots that they had made in various places were found to be little more than roughage. It had no value from a nutritional viewpoint.

Consumers aren't aware of that. A carrot is a carrot to a consumer.

Dr. FINNEY. That's right. ARS has long had improvement in the nutritional quality of foods as a core part of the ARS mission in nutrition. ARS scientist, Phillipp Simon, recently released a carrot variety called Beta 3 that has a threefold increase in beta carotene. Seeds of this variety have been distributed world-wide, particularly to those countries where vitamin A is limiting in the diet and the variety is commercially available in the U.S. We also have research underway to further increase the carotinoid content of cucumber and tomato, for this is not only an issue of vitamin availability but also one of health and wellness. So to this end, we have a plant breeder as a member of this staff of the Children's Nutrition Research Center in Houston, Texas. As you know, the National Cancer Institute—NCI—is investigating the role of carotinoids as antioxidants in cancer prevention. Recent studies with women at our Western Human Nutrition Research Center in San Francisco, California, have shown that oxidative damage increased on a low carotene diet and then decreased after carotenes were increased. In support of the NCI research, scientists in the Nutrient Composition Laboratory in Beltsville, Maryland, have developed a table which contains the minimum, maximum and median levels of beta carotene and four other beta carotene related compounds, which also function as antioxidants, in more than 120 foods.

We are indeed embarking on a new era where the integration of health, diet and nutritional quality of foods produced are intimately related.

Mr. DURBIN. I think as we embark on consumer education, this is an important component.

Dr. FINNEY. Very important, yes.

Mr. DURBIN. Mr. Walsh, did you have any other questions?

Mr. WALSH. No, no questions.

Mr. DURBIN. Okay, Mr. Pastor?

Mr. PASTOR. No more questions.

Mr. DURBIN. Thanks. Enjoyed your testimony.

Dr. FINNEY. We appreciate the opportunity of visiting with you today.

Mr. DURBIN. Good to have you all back.

Dr. FINNEY. And we appreciate your time. Thank you.

Mr. DURBIN. Mrs. Vucanovich, a Member of the Subcommittee, has some questions she would like answered for the record.
[The questions and responses follow:]

CLOSURE OF LABORATORIES

Ms. VUCANOVICH. The Department of Agriculture's budget calls for the closure of several laboratories under ARS. What qualifications are being used to determine this closure?

Response. The Agricultural Research Service is proposing a budget that emphasizes priority research initiatives including: food safety; pesticide reduction and alternatives to pest control; and funding alternatives to methyl bromide. In order to accommodate these needs it is necessary to reduce or terminate some ongoing research. These resources will be reallocated to the higher priority research issues. These shifts are necessary given budgetary constraints and limited resources.

The projects and resources associated with location closures have been carefully reviewed and evaluated in a national context. Several criteria were applied: Physical condition of facilities; relationship to similar programs at other locations; critical mass of scientific staff/interactions; essential or unique role in National programs; relationship to State and private sector capabilities; maturity of the technology; base of knowledge available; essential role in support of Action Agencies of Department.

Ms. VUCANOVICH. How is "high priority" research defined?

Response. ARS considers the highest priority research to be those programs relating to the solution of technical agricultural problems of broad scope and high national priority required to ensure adequate production of high quality food and agricultural products to meet the needs of the American consumer, to sustain a viable agricultural economy, and to maintain a quality environment and natural resource base. These would include programs in support of the needs of Federal action and regulatory agencies, such as FSIS, APHIS, FDA, and others, research to respond to critical problems as expressed to us by the Joint Council and Users Advisory Board, various commodity and user groups, scientists, and other public and private research collaborators. Priorities are also established by the Secretary of Agriculture and other Administration officials. Many issues of critical importance are also advanced by the Congress.

Ms. VUCANOVICH. Where will the savings from these closures go?

Response. We expect that most of that total budget of the 19 locations proposed for closure will be used in FY 1995 for the relocation costs of personnel affected by the closures. However, we expect that most of these funds will be reflected as actual savings beginning in FY 1996.

MONTPELLIER, FRANCE

Ms. VUCANOVICH. Please describe the work that is being completed in the facility at Montpellier, France?

Response. The United States experiences on average one major new agricultural pest introduction every three years. These insect and weed pests arrive without their natural enemies which keep them under control in their country or origin. With increased commerce, it is expected that this flow of immigrant pests will not decrease and may in fact increase. The USDA has maintained a laboratory in France since 1919 to search for biological control agents that could be used in the U.S. against pests originating from Eurasia and northern Africa. There have been many successful projects. Currently the laboratory is working on high priority insect pests such as the sweetpotato whitefly, Russian wheat aphid, gypsy moth and rangeland weeds for example, leafy spurge, yellowstar thistle, Russian thistle, knapweeds and common cuprina.

Ms. VUCANOVICH. Would it be more cost effective to complete this research in the United States, rather than build a new facility in France?

Response. It is neither cost effective nor possible to conduct this research in the United States. The immigrant pests in the United States are generally not a pest in the region of origin and in some cases are quite rare. It is necessary to determine which natural enemies are keeping the pest in check by conducting ecological investigations in the foreign countries that are the original home of the pest species.

Ms. VUCANOVICH. Is it necessary for this work to be completed in France?

Response. It is important to determine which of these biological control agents are host specific. This can only be accomplished in the region of origin. Host range testing of weed insects and pathogens is more meaningful when the protocol can include testing out of doors in the natural environment. This is impossible to do in the United States.

RANGELAND RESEARCH

Ms. VUCANOVICH. In the past, ARS has completed research on range issues. Do you foresee the need for additional research and where, on the scale of priorities, does range research fall?

Response. Rangeland research continues to be among ARS' priority strategic objectives. Linkages between locations are being strengthened to more efficiently focus resources on the top priority problems. These critical areas include the development of new biocontrol technologies for range weeds, improved plants varieties, improved management strategies, and decision support systems for rangeland ecosystems. We also coordinate our rangeland research program with the Forest Service and other agencies.

Mr. DURBIN. Mr. Obey, the Acting Chairman of the Appropriations Committee has a question he would like answered for the record.

[The question and response follow:]

PROPOSED CLOSURE OF POTATO RESEARCH LABORATORY

Mr. OBEY. Wisconsin's potato growers are extremely concerned about the proposed closure of the USDA/ARS Potato Research Laboratory located in East Grand Forks, Minnesota. They feel that closing this facility would be a tremendous loss to the entire potato industry. According to Wisconsin's potato growers this lab engages in unique and essential research into potato production, quality and disease that cannot be duplicated elsewhere.

What steps are you taking to address these concerns and to ensure that the valuable research at East Grand Forks will continue?

Response. The ARS laboratory in East Grand Forks, Minnesota has been a successful partner in the Federal-State-private industry collaboration to improve quality and reduce losses for the farmer, market handler and processor. They have resolved postharvest handling and storage issues and developed an expert system to guide producers and processors in storage loss prevention. Current research activities on sprout control will be continued at the ARS Northern Crop Science Laboratory at Fargo, North Dakota. The pilot-scale facilities for variety performance evaluation are important to the breeder and the industry. We propose that these facilities be made available through GSA for use by organizations who could operate them on a user fee basis. This proposal has been made to the Red River Valley Potato Grower Association, and to the University of Minnesota and North Dakota State University.

Mr. DURBIN. Our colleagues, Congressman Farr and Congressman Deutsch, also have some questions for you to answer for the record.

[The questions and responses follow:]

METHYL BROMIDE ALTERNATIVES

Mr. FARR. A top priority for agriculture is the research and development of methyl bromide alternatives. What is the status of your current research efforts?

Response. I agree that finding replacements for methyl bromide uses is of utmost importance to U.S. agriculture and ARS is taking significant steps to make sure that our methyl bromide alternatives research program is focused on the most important researchable issues and that our research is coordinated with other research organizations working in this field. To accomplish this, ARS participated last year, 1993, with other USDA agencies, states, universities and industry in two workshops to exchange information on research plans to address high priority needs, commodities, and uses.

The first was a large USDA sponsored workshop in June, 1993, attended by about 225 people including 110 scientists. ARS used this workshop to gather facts about others' research projects intended to develop methyl bromide alternatives. Scientists in attendance representing Federal, state and university research efforts came from all regions of the U.S. where methyl bromide is important to the agriculture community.

The second workshop, jointly sponsored by industry and ARS was held in October, 1993, in San Francisco and gathered information about others' research projects intended to develop efficient, practical systems to recover methyl bromide and prevent its release to the atmosphere. Summaries for both meetings have been published.

On the basis of information gathered from these workshops, ARS is putting more of its resources into research for methyl bromide alternatives for postharvest and soil fumigation uses. ARS base funding levels for methyl bromide alternative research in 1993 and 1994 were \$7,455,100 and \$8,453,600, respectively. Additional effort is planned in FY 1995, including a proposed \$5,000,000 budget increase and \$5,000,000 redirected from lower priority existing base ARS research projects.

Mr. Farr. Given USDA's tough budget constraints I am very pleased to see that you have requested an additional \$5 million for methyl bromide alternatives research. It is my understanding that the Agriculture Research Station in Salinas will be an active partner in the ARS methyl bromide research effort. How will you spend the requested funds?

Response. At Salinas, we intend to use the requested funds to develop biologically-based management strategies for soilborne pests of vegetables and strawberries including pest resistant crops and cultural practices. Specifically, ARS will develop and evaluate pest-resistant hosts; we will develop cultural practices to mitigate effects of soilborne pests; ARS will evaluate existing chemicals available as soil fumigants for soilborne pests; ARS will develop improved application technology for chemical alternatives to methyl bromide; and we will develop Integrated Pest Management strategies for vegetables and strawberries.

CHAPMAN FIELD LABORATORY

Mr. DEUTSCH. What is the projected cost for closure of the USDA-ARS Chapman Field Laboratory?

Response. The projected estimated cost of closing the location varies significantly depending on an employee's acceptance of a transfer. It is ARS' intention to offer relocation to all permanent employees. The estimated costs associated with the proposed location closure includes costs of relocating all permanent employees; or relocating one-half to one-third of the employees, and separating the remaining employees not willing to transfer to another ARS location. The estimated costs associated with separating an employee, such as, severance pay and lump-sum leave payments, have been included in personnel options 2 and 3 below. In addition to the personnel costs, ARS also will incur an estimated \$343,000 for miscellaneous closure costs associated with disposition of the facility, including boundary surveys, environmental assessments and remediation, and site security and maintenance until disposal of the property. The estimated closure costs are as follows:

1. If all employees are relocated, closure costs are estimated at \$1,800,000.
2. If one-half of the employees accept relocation offers and one-half are involuntarily separated, closure costs are estimated at \$1,020,000.
3. If one-third of the employees accept relocation offers and the other two-thirds are involuntarily separated, closure costs are estimated at \$761,000.

Mr. DEUTSCH. Has USDA conducted an Environmental Assessment regarding site closure to ensure compliance with NEPA requirements?

Response. Although we have not yet conducted an Environmental Assessment regarding site closure, we intend to do so as part of the closure process.

Mr. DEUTSCH. What is the status of site contamination including waste pesticides, fungicides, herbicides, or fuels? What are projected costs to remove and clean up these materials?

Response. There is no known site contamination at this location. In 1992, the location replaced six petroleum underground storage tanks with two aboveground storage tanks. Twelve cubic yards of petroleum-contaminated soil—that was to be disposed of—blew away during Hurricane Andrew. The State of Florida was notified, and no further action has been required.

Mr. DEUTSCH. What are the projected costs for relocation of USDA ARS employees from the USDA-ARS Chapman Field Laboratory?

Response. The cost to relocate an employee is estimated at \$60,000 and includes reimbursement to permanent employees for costs associated with selling and buying a residence, travel, transportation and temporary quarters for the employee and eligible family members, and shipment of household goods. The cost to relocate employees from our Miami location is estimated as follows:

1. All relocated (30 employees)	\$1,800,000
2. One-half relocated (15 employees)	1,020,000
3. One-third relocated (10 employees)	761,000

CHAPMAN FIELD LABORATORY

Mr. DEUTSCH. How much in USDA funds have been expended to date for recovery from Hurricane Andrew at the Chapman Field site?

Response. In fiscal year 1993, \$1,285,000 was allocated to this site from the funds provided in the Dire Emergency Supplemental Appropriations Act of 1992 for clean-up of damages from Hurricane Andrew. To date, \$959,719 has been expended in this recovery effort.

USDA—ARS CHAPMAN FIELD LABORATORY

Mr. DEUTSCH. If subtropical germplasm and research facilities are consolidated in Puerto Rico and/or Hawaii, doesn't this increase the risk of losing germplasm in the event of future hurricane or natural disasters at these sites?

Response. Tropical germplasm from Miami will be transferred to more hospitable environments in Puerto Rico and Hawaii where it will be less susceptible to loss. In Miami the germplasm is subjected to occasional winter cold periods in which damage varies with the microenvironment on the station. Banana plants must be located in protected areas and space for that is limited. Other natural disasters are no more predictable for one location than another. Since there is currently no back-up for the Miami collection, the risk factor upon relocating plant material to Puerto Rico or Hawaii will remain the same as at present.

CHAPMAN FIELD LABORATORY

Mr. DEUTSCH. Has USDA utilized an architectural historian to survey historic buildings at Chapman Field site and assess National Register eligibility?

Response. ARS has not initiated contract work for an architectural historian to survey historic buildings at this site and assess National Register eligibility. As part of the disposal process, ARS will take those steps required under Section 106 of the National Historic Preservation Act to minimize harm to any properties eligible for inclusion on the National Register of Historic Places.

Mr. DEUTSCH. Has USDA initiated the "106 review process" contained in 36 CFR part 800 pursuant to Section 106 of the National Historic Preservation Act?

Response. ARS has not initiated the 106 review process. This will be part of the property disposal action to be undertaken by ARS. ARS will take those steps required under Section 106 of the National Historic Preservation Act to minimize harm to any properties eligible for inclusion on the National Register of Historic Places.

USDA—ARS CHAPMAN FIELD LABORATORY

Mr. DEUTSCH. What is the projected cost required to move the germplasm collection from Chapman Field site to another location?

Response. The estimated cost for relocation of the germplasm is approximately \$100,000 on a one-time basis.

Mr. DEUTSCH. What is the projected savings associated with maintaining the germplasm collection at other USDA sites?

Response. The consolidation will result in increased efficiency in managing and using the collection and provide a critical mass of personnel to carry out the activities.

Mr. DEUTSCH. Has ARS considered moving the germplasm collection to another South Florida site? For example, the University of Florida's Tropical Research and Education Center at Homestead?

Response. ARS has discussed relocating selected germplasm with other South Florida sites, including the Institute of Florida Agricultural Sciences (IFAS) at Homestead, Fairchild Gardens, Dade County, and the State of Florida Forest Service.

Mr. DEUTSCH. What steps will USDA—ARS take to ensure that Florida growers have continued access to the germplasm collection?

Response. Germplasm samples of all the stocks will be offered to Florida institutions before the move begins. ARS expects the breeders from both the public and private sector will want to take cuttings of the germplasm. In the future, they can request material from Puerto Rico and Hawaii via the Germplasm Resources Information Network. It is ARS policy to make germplasm in our collection available for research nationally and internationally to all bonafide users.

Statement of Dr. R. Dean Plowman, Acting Assistant Secretary for Science and Education, United States Department of Agriculture, before the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies.

Mr. Chairman and members of the Committee, I appreciate the opportunity to provide you with an overview of the science and education programs of the Department of Agriculture. I am accompanied today by the Agency Administrators and their senior staff who are in a position to provide you with the details of each of the Agency budgets. I would like to provide just a brief overview of the research and education proposals and some insight into our rationale for the proposals we are making. In total, our budget for fiscal year 1995 requests nearly \$1.6 billion to fund research and extension programs, down slightly from the current year. In addition, we are requesting about \$25 million to continue a program of laboratory improvements at ARS facilities.

RESEARCH PROGRAMS TO MEET CURRENT NEEDS

Mr. Chairman, as we developed our budget proposals, we reviewed the opportunities and challenges facing agriculture, and the contributions that research and education programs can make. Members of the Committee will appreciate the ability to identify many more areas where science and technology can have a positive impact than there are funds to pursue those opportunities. At the same time, we recognize that needs of producers and consumers are not

static and, if we are to be of the greatest service, we also must continually review our programs and focus limited resources to the most pressing needs and those where the broadest sector of our citizens can reap the benefits. I believe that you will see the results of this review in the budget we are discussing today. I also want to note for the Committee that we have been developing plans for a new organizational structure that would combine the existing agencies within Science and Education into a single entity as part of the Secretary's reorganization plan for the Department. Implementation of this plan would offer the benefit of a single program planning and management structure with enhanced coordination and associated resource savings.

Within a total level slightly below the current year, we are proposing significant levels of support to address the top issues that we in the Department -- and I suspect, Members of the Committee -- have been hearing about over the past year or so. Included are microbial food safety, alternative methods of pest control, new quarantine and soil treatments to replace methyl bromide, utilization of wastes and others. Our approach involves redirection of existing resources in conjunction with new funds to support a critical mass of effort to address major issues in an interdisciplinary manner. Mr. Chairman, I particularly want to highlight the importance of the approach we are proposing as a means to devote the level of resources that will be required to solve National problems in an appropriate timeframe. An example will demonstrate the need to take this approach to provide a critical level of support.

As you realize, EPA has formally listed methyl bromide as a Class I ozone depleting compound under requirements of the Clean Air Act Amendments of 1990. By the year 2000,

just six years from now, domestic production and use of this critical soil and quarantine fumigant will be banned. Our challenge is to develop, within this timeframe, feasible alternatives for the hundreds of production and postharvest uses for this product. To help place this in perspective, I note that nearly every different commodity use will require a dedicated research effort -- in some cases, different horticultural varieties of the same commodity require different alternative treatments to provide adequate quarantine protection without degrading product quality. At stake is an export market of hundreds of millions of dollars in U.S. fruits and vegetables and an estimated impact on domestic production of about one billion dollars. Given the overall targets for discretionary spending, the only way that we can provide an appropriate response to this need is through a combination of new funding and redirections within our base programs. This is but one example. We are similarly proposing to devote major new and redirected funds to food safety and improved integrated pest management programs. Dr. Finney will be in a position to provide additional details of our plans in this area.

FEDERAL LABORATORY STRUCTURE

This budget also proposes savings through the streamlining and restructuring of our Federal laboratory system. As a result of an intensive year-long process, we have identified 19 lab locations and two programs that we propose to close. Closure of these locations will permit us to redirect over \$18 million annually to other critical research projects and will allow us to avoid millions of dollars in maintenance and improvement costs at these locations. Better utilization of available space at other locations will effectively lower the unit overhead costs.

In making these proposals, I do want to emphasize that we will do everything we can to accommodate all impacted employees. These employees have made significant contributions to the Department's food and fiber research goals. As always, we are prepared to provide additional information that the Committee deems necessary to evaluate these requests.

PROGRESS IN MEETING CHALLENGES

When I came before this Committee last year, we were confronting serious issues raised by the contamination of meat with *E. coli*. Today, I am pleased to report that our researchers have made some advances over the past year that will provide a scientific basis to improve the safety of our meat and poultry supply. Working to meet the needs of the Food Safety and Inspection Service, scientists at the ARS lab in Clay Center, Nebraska, have developed a rapid test that can assess the presence of microbial contaminants on carcasses. Evaluation of this test is currently underway in slaughter plants in conjunction with FSIS. In the longer term, advances in developing genetic maps for livestock will provide the basis for the production of animals that are inherently resistant to diseases, parasites and foodborne pathogens. Essex Finney will have more to say about these major advances. It is this kind of output that keeps me optimistic about the ability of research to continue to improve the quality of our lives, and maintain a sound, profitable agriculture sector.

OPPORTUNITIES FOR PROGRESS

Mr. Chairman, these advances also highlight the critical importance of the investment we make in supporting a system of institutions that is capable of responding to changing needs. I refer here to the unique partnership in which we participate with the land-grant universities. We propose to continue our support for the State Agricultural Experiment Stations and related formula programs. Although the Hatch Act represents less than 10 percent of funds at the experiment stations, these funds provide a critical, stable level of base support and have the effect of leveraging significant amounts of non-Federal funds into these programs. At the historically black 1890 institutions our funds represent nearly all resources available for research.

In addition, these State institutions are ready to perform National interest research that is funded on a competitive basis through the National Research Initiative. In total, we propose a \$24 million increase in the NRI, for a total program of \$130 million. This investment will provide support necessary to solve specific, emerging problems. Let me provide just one example of a significant advance that the NRI produced. Researchers supported through an NRI grant have gained an understanding of the basic mechanisms that confer salt tolerance in some plants. Researchers have subsequently transferred these genes into other plants and demonstrated the ability to provide a level of tolerance to salt and drought conditions. This kind of advance, the result of basic research, will help solve problems of production in degraded soils and times of plant stress during drought.

DEVELOPING HUMAN CAPITAL

We look to the university system to perform another critical role -- that of educating the next generation of scientists. Funds are proposed to continue four highly successful programs in graduate and undergraduate education, challenge grants to promote excellence in education and the 1890 Capacity Building Grants. These cost-effective programs have had a high payoff for us -- particularly in attracting academically superior graduate students and enhancing the diversity of students pursuing the agricultural and food sciences. They have also been the primary force behind the initiatives undertaken by the 1890 institutions to strengthen their capacity. Although we identify a discreet set of programs targeted specifically to this goal, we also recognize the significant role that the NRI and the base programs provide in supporting graduate education. Our budget for higher education programs is included under the Cooperative State Research Service, and Dr. Jordan will have more details on those programs.

IMPORTANCE OF TECHNOLOGY TRANSFER

In recent years, we have taken steps in the research agencies, through a number of means, to increase the flow of technology from the Federal and university labs to the point of commercial adoption. We are pleased with the results of those programs and are continuing

our efforts in this regard. Given the nature of Federally-funded research, many of our results reside in the public domain and we look to the Extension Service to take this information and package it into a form that can be presented to the public at all levels, including producers and consumers of agricultural and forestry products.

Consistent with our research proposals, we are requesting continued support for the basic Extension programs that guarantee the continuation of the partnership system that has served us so well for 80 years. Disasters in the Midwest and Los Angeles have served to highlight to all of us the immense value of that partnership. Extension was available, in all of the States adversely affected by the floods, to provide leadership in assisting victims and in organizing volunteer efforts to help thousands meet basic everyday needs and plan for a long-term recovery. Similarly, Extension has been present to help in the aftermath of the recent earthquakes in California. Through this partnership mechanism, we are able to focus the efforts of thousands to meet National interest needs. The 1995 budget proposes increases to tap the resources of this system in improving food safety, increasing the implementation of sustainable agriculture practices and transferring knowledge about improved integrated pest management practices. I will look to Dr. Leodrey Williams, the Acting Administrator, to provide you with the details of those proposals.

AGRICULTURAL INFORMATION

Members of the Committee are generally familiar with the National Agricultural Library. It is a resource that many of us in the research community take for granted, but yet all of our scientists rely on the services it provides and would be hard pressed to perform cutting edge research without the information NAL provides. Most of us, with only a moment's thought, recognize that a revolution is occurring in the handling of information -- and nowhere is this felt more than at NAL. Mr. Chairman, the Library has truly been struggling to maintain the kind of modern services that our researchers rightly demand. For this reason, I am particularly pleased to highlight for the Committee a proposal to fund an Electronic Information Initiative at NAL. Funds would support the development of a capability to deliver and receive information electronically through the Internet and other means. We are also proposing modest increases to maintain the basic services of the Library.

1890 CENTERS OF EXCELLENCE

Mr. Chairman, before I close, I would like to draw your attention to some important projects for which we are seeking very modest budget increases. Beginning in 1994, ARS has provided support to Tennessee State University, a historically black 1890 institution, to develop a Nursery Crops Center of Excellence. I am pleased to report to the Committee that the project is proceeding well, and I particularly want you to know that the industry is fully involved and very supportive of the project. We are proposing that a portion of the ARS

increase for food safety be devoted to developing a Center of Excellence at the University of Maryland-Eastern Shore to bring additional talent to solve vexing problems in this area. FSIS and APHIS are also participating in the development of this Center. I strongly urge your support for these important projects.

SUMMARY

In summary, I want to reiterate my positive outlook on the programs that are included in this budget. We are proposing some adjustments to accommodate higher priority initiatives. This is necessary given the tight budget and limited resources. Throughout this process, we intend to manage our resources in a coordinated manner and to involve cooperators and users of scientific knowledge in the planning of our programs. We look forward to the opportunity to work with you and your staffs as you deliberate the merits of the proposals contained in the budget. With that, I will be pleased, along with the agency administrators accompanying me today, to answer questions that the Committee may have.

AGRICULTURAL RESEARCH SERVICE

Statement of Dr. Essex E. Finney, Acting Administrator, Agricultural Research Service, United States Department of Agriculture, before the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies.

Mr. Chairman, and members of the Committee. I appreciate this opportunity to present the Agricultural Research Service's budget recommendations for FY 1995, and highlight some of the Agency's accomplishments of the past year. The Agricultural Research Service's proposed FY 1995 Budget is \$701,218,000. This represents a net increase of \$17,317,000 over the 1994 Appropriation Act.

Mr. Chairman, I would also state that the budget was finalized before we could incorporate the transfer of the Human Nutrition Information Service to the Agricultural Research Service. The Explanatory Notes and other budget materials do not reflect this reorganization. The Department is taking action to immediately effect this transfer. I would be pleased to provide any written information or meet with the Committee at your convenience to discuss any issues regarding this activity.

This budget reflects a number of significant changes. The purpose of these changes is to ensure that ARS continues to address the highest priority problems

confronting American agriculture. These changes are consistent with the Secretary's Reorganization Plan for the Department, which includes adjustments in selected programs, reductions in personnel and supervisory layers, and elimination of some field operations. All of these proposed changes--the program increases, redirections, and reductions--will result in significant efficiencies and savings, while focusing ARS squarely on the most vital issues of concern to agriculture and the American public.

Mission

Agriculture has demonstrated its capacity to be an engine for rural and national economies, be a wise steward of natural resources and the environment, help provide for energy security, assure an adequate and economical food and fiber supply, provide for food safety, and enhance human health. The Agricultural Research Service has the human and physical resources and the means to make significant contributions to the Nation's well-being.

The ARS budget for FY 1995 addresses some of the most significant current research challenges. Research to solve agricultural problems and also help resolve societal concerns has been the focus of ARS basic and applied investigations. Research priorities which center on food safety; diet and

nutrition; alternative pest control technologies; new uses for agricultural commodities; elimination of trade barriers; enhancement of domestic and rural economies; plant and animal biodiversity and germplasm, and protection and conservation of our natural resources are some of the many issues addressed in the ARS budget.

As you are aware, the priorities and urgencies in agricultural research are many, but, resources are limited. The Agency is proposing a budget that accommodates several new and expanded priority research initiatives. In so doing, we have proposed to reduce or terminate some research and close 19 of our research locations to meet these needs. These resources would be reallocated to finance the higher priority research identified in this budget. Resource constraints require that we make these adjustments.

The projects and resources associated with termination and reallocation have been carefully reviewed and evaluated in a national context. We consider all of our research important, but everything has a relative priority to the total. These shifts are necessary if agricultural research is to address the critical problems facing producers and consumers. These adjustments are also necessary if we are to deal with the downsizing of the Federal workforce; if we are to make better use of existing Federal locations; and if we are to play our part in reducing the

Federal deficit.

These reductions, terminations, and close outs will affect some 300 people in ARS. So, we do not take this action lightly and without a great deal of anguish. The accomplishments and dedication of our people are not to be ignored. Their work has contributed to this Nation's great agricultural achievements. We will do everything possible to accommodate these impacted employees in terms of redirected assignments, transfers, and providing new career opportunities.

Redirections

In addition to these program actions, ARS is proposing to shift emphasis to projects contributing to food safety, methyl bromide and pesticide reduction. These shifts in focus will be effected at existing locations utilizing current personnel, funds, and facilities.

Major Breakthroughs

Let me touch briefly upon a few major recent research breakthroughs that may be of special interest to the Committee. A team of USDA scientists at our Clay Center, Nebraska facility has developed and published the world's most complete

genetic linkage maps for swine and cattle. These scientists have also developed the first interactive genomic data base for livestock. These scientific accomplishments have major significance for U.S. and world animal agriculture interests, as well as positive benefits for American consumers and the environment. This research will lead to technology that will assure a continued favorable competitive position for U.S. agriculture in world markets.

Genetic maps such as those produced by ARS scientists will provide the scientific basis necessary to develop new technologies for the U.S. livestock industry. This kind of technology is already being used. For example, sectors of the dairy industry are using genetic markers to select for specific proteins in milk. Genetic maps will allow these technologies to be developed faster and much more efficiently. These technologies will lead to major improvements in productive efficiency, a higher quality product, and animals genetically resistant to diseases, parasites, and foodborne pathogens. The production of food animals genetically resistant to diseases, parasites, and in the longer term, foodborne pathogens, such as salmonella and E. coli will result in a safer food supply and an improved environment due to the need for fewer chemicals and pesticides.

In the postharvest slaughter area, Clay Center scientists have adapted a bacterial assay, used in pharmaceutical and other industries, for the meat industry. This

rapid test involves measuring microbial adenosine triphosphate (ATP), the form of energy storage in all cells, to determine if carcasses have been properly cleaned of extraneous contamination. FSIS and ARS are currently evaluating this rapid test in commercial slaughter plants. ARS scientists are optimistic that rapid diagnostic assays can be developed in the near future to begin testing for bacterial contamination of meat in commercial slaughter plants. Clay Center researchers have also evaluated the efficacy of carcass washing with organic acids, such as acetic (vinegar), lactic, and citric acids. Diluted organic acid washes will substantially reduce, but will not eliminate, bacterial contamination on beef carcasses.

New and Expanded Research Initiatives

I would like to briefly review the recommended increases in the budget. Seven research initiatives are proposed—they are all in areas of vital importance to the mission of the Department.

Food Safety Research

Certainly one of the most important concerns of the American public is food safety. The public has become acutely aware of the dangers associated with food

contaminating pathogens, such as E. coli, in food. Agriculture's ability to meet food safety standards and maintain consumer confidence is critical.

ARS is recommending a \$10,000,000 increase for food safety research. Plans also call for the shift of \$5,000,000 from ongoing projects into food safety research. This will be carried out in existing laboratories.

The increases in food safety research will focus on identifying hazards and developing effective pre- and postharvest production and processing microbial control technologies. For example, sources of infection in animals will be identified, and vaccines and other disease control measures will be developed. Improved methods of slaughtering and processing, including alternatives to the use of chlorine, will be developed to minimize sources of contamination. In addition, irradiation studies with beef, pork, and poultry will be conducted to include different E. coli strains.

Pesticide Reduction in Fruits and Vegetables

During 1993, the Administration announced plans to reform the Nation's pesticide laws to reduce the risks of pesticides to Americans, especially infants and children. USDA will perform a significant role in conducting research, providing

education, collecting data and performing economic analyses to support the initiative. Traditional methods of pest control have frequently relied upon the use of chemicals. Scientific advances make it possible to rely more heavily on biological controls and advanced farm management systems.

ARS is recommending a \$7,500,000 increase to develop alternative pest control methods and systems. We also plan to redirect \$2,600,000 of our resources from other research projects into this priority area at existing laboratories.

The increases for pesticide reduction will be used to undertake large-scale pilot tests in fruits, vegetables, and other crop production areas--to develop promising pest control technologies and systems, such as releasing specific biological agents, using different genetic mechanisms, evaluating the effectiveness of certain attractants, using resistant varieties, and adopting specific cultural practices. This initiative will address pest species that are responsible for 80 percent of the insecticides and other pesticides currently used in fruits, vegetables, and other crop production systems.

Alternatives to Methyl Bromide

A third program area relates to research on methyl bromide alternatives. In this

area, ARS is recommending a \$5,000,000 increase. An additional \$5,000,000 will also be redirected into this high priority area from other ARS projects at existing locations.

Presently, methyl bromide is the only satisfactory postharvest fumigant of fresh commodities for insect pests. The Clean Air Act, however, mandates the complete phaseout of methyl bromide by the year 2000. Its loss will have a severe impact on the shelf life of U.S. agricultural commodities. Its loss will also adversely impact the U.S. import and export markets: many imported fresh fruits and vegetables currently must be fumigated with methyl bromide; similarly, many U.S. agricultural commodities for export must be fumigated depending on the commodity and country. The loss of methyl bromide as a soil fumigant for agricultural uses will adversely affect U.S. crop production.

With the proposed increases, various methyl bromide alternatives will be developed and studied to determine their effectiveness and feasibility. Soil fumigation alternatives, including biological control, host resistance, cultural practices, and chemical control will be evaluated. In addition, quarantine alternatives, which include combination treatments and physical control treatments, such as temperature and ionizing/nonionizing radiation, will be fully explored.

Nutritional Labeling

ARS is recommending an increase of \$3,500,000 for research on the development and standardization of measurement systems for nutrient labeling of foods. Standard reference materials for food matrices will be developed. Methods for nutrient labeling will be standardized. In addition, new data on food composition will be developed and made available to food service institutions, industry, health care professionals, other government agencies and the public.

Binational Agricultural Research and Development

ARS is proposing an increase of \$2,500,000 in support of U.S.-Israel Binational Agricultural Research and Development or BARD. These funds will supplement the interest from the BARD binational endowment and will be made available for competitive grants for joint U.S.-Israel agricultural research projects. The additional funding will be matched by the Government of Israel and will support all aspects of agricultural research within the mission of ARS.

Preservation of the Agricultural Biodiversity of Wetlands

Wetland ecosystems form an integral part of most agricultural lands and

contribute significantly to their biodiversity. Interrelationships between the flora and fauna found on wetlands are not adequately understood. ARS is recommending a \$1,000,000 increase for research on the agricultural biodiversity of wetlands, focusing primarily on coastal areas and the lower Mississippi Delta region.

Research on Co-Composting Wastes

ARS is recommending an increase of \$1,000,000 for research on co-composting wastes. Co-composting, or combining and composting wastes from different sources appears to have potential for making valuable and usable resources. Guidelines for co-composting these wastes to overcome objectionable characteristics however are not available and need to be developed. With the additional funding, practical guidelines will be developed. Also, methods for incorporating and growing beneficial organisms in composts to help control insects, diseases, and nutrient deficiencies will be developed.

ARS' program increases for FY 1995, which I have just outlined, total \$30,500,000. In addition, ARS is recommending \$12,569,000 to finance the costs of inflation, pay raises, and SES lump-sum payments.

Budget Reductions

As I mentioned, this budget proposes a number of research reductions, terminations, and location closures. Given ARS' limited resources they represent a necessary trade-off of research priorities in a difficult budget climate. This Committee is very aware of both the Administration and Congressional policies and intentions to streamline government, reduce the number of Federal employees and cut spending to meet deficit and higher program priority needs. This budget is formulated under these tough and arduous times. These current research projects can no longer be continued given ARS' limited resources and the need to place more resources in those areas of more critical concern.

The research programs and laboratories proposed for closure will save \$18,700,000. This action will enable the Agency to reallocate resources for new and expanded initiatives, including food safety, methyl bromide alternatives, and pesticide reduction as noted earlier. The Committee has been provided a listing of all the proposed research reductions and location closures.

ARS is also proposing savings of \$7,052,000 from the reduction of discretionary expenses, such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

Buildings and Facilities

ARS is recommending a total of \$25,700,000 for the renovation and modernization of selected facilities. Of this total, \$13,100,000 is proposed for the renovation and modernization of ARS' National Research Centers in Albany, California; New Orleans, Louisiana; and Peoria, Illinois. An investment of resources is essential for these Centers to regain the scientific capacity necessary to deliver viable and timely research discoveries.

ARS is proposing \$5,000,000 toward the continuation of the modernization of the Beltsville Agricultural Research Center. Most of the major facilities and utility support systems at the Center were built in the 1930s and 1940s. Deterioration and obsolescence of the 50-year old facilities are hampering the scientific research of the Center as the preeminent agricultural research center of USDA.

An increase of \$5,000,000 is also being requested for ARS' Plum Island Animal Disease Center which serves a critical role in support of the U.S. livestock industry. The funds will be used for infrastructure improvements and environmental compliance requiring immediate repair or replacement. These repairs are necessary to bring ARS' facilities into compliance with Federal, State, and local laws.

An increase of \$2,600,000 is being proposed for the construction of a new facility for ARS' European Biological Control Laboratory in Montpellier, France. The laboratory's current facilities are crowded and dispersed. The continued success of this research which seeks alternatives to chemicals for pest control depends upon construction of an appropriate facility.

Accomplishments

In my opening remarks, I mentioned a couple of significant ARS' accomplishments. I would like to highlight for you just a few of ARS' other accomplishments during the past year.

- o ARS scientists have shown that gamma radiation during processing can reduce the probability of the E. coli pathogen being present by a thousandfold, using the currently approved minimum radiation dose for the treatment of poultry. E. coli 0157:h7 in undercooked or raw meat has been linked to serious outbreaks of illness and some deaths, particularly in children.

- o A master "switch gene" has been identified by ARS scientists that triggers aflatoxin production in the mold that attacks peanuts and produces a poison. This research allows an efficient marker to search for new breeds of plants that produce natural chemicals that inhibit the master gene, thus eliminating aflatoxin contamination of crops. Aflatoxin causes severe losses in several major farm crops.
- o ARS investigators found that African-Americans have higher blood levels of the active forms of Vitamin D than European-Americans. A possibility exists that African-Americans have less excretion of Vitamin D which may account for their higher bone mass and calcium retention. This research could prove highly useful for establishing older adult dietary requirements.
- o A simple strategy has been developed by ARS investigators for improving the weight gain in nursing low birth weight infants. To enable weight gain

equivalent to in utero gains, human milk was fortified with a fraction of the mother's milk - hindmilk, the last mother's milk in a feeding - to increase lipid content. Infants fed with the fortified milk increased their weight significantly.

- o ARS scientists in cooperation with the University of Missouri have developed molecular markers for identifying by DNA fingerprinting the location of important agronomic, stress and disease resistance traits in both corn and gamagrass. In the past, limited genetic information has hindered the transfer of genetic traits between the two species.

- o Amber spurge fleabeetles were tested as a biocontrol agent by ARS scientists in Montpellier, France, and then brought to an ARS experimental site in the U.S. The beetle was found to dramatically reduce leafy spurge infestations and permit restoration of native vegetation.

- o An ARS scientist has developed a technology which makes preselection of sex in livestock and humans now possible. The technology could save the livestock industry millions of dollars annually. It is also being applied to preventing X chromosome-linked disease transmissions in humans.
- o ARS scientists have found that water quality is not affected by the application of postemergence herbicides where no-till practices are used to control soil erosion. Preemergence herbicides were detected in runoff and shallow groundwater, but no postemergence herbicides were found.
- o New varieties of lupines that produce more grain with higher protein content, which would be useful to the South, have been developed by ARS scientists. Lupines could provide a crop needed to protect land; reduce fertilizer needs, and reduce the buildup of diseases, weeds, and insects.

- o A sensor that was developed by ARS engineers to check organic matter and moisture levels in soil has been redesigned for applying herbicides more precisely. The sensor provides information in seconds to permit variations in herbicide application rates.

Our challenge is to continue solving the difficult problems facing agricultural producers and consumers, whether it relates to production efficiency, food safety, human nutrition, the economy, U.S. trade, or the environment.

Mr. Chairman, this concludes my prepared remarks. I will be happy to answer any questions.

AGRICULTURAL RESEARCH SERVICE

Purpose Statement

The Agricultural Research Service (ARS) was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by ARS is authorized by the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201, 2204), the Research and Marketing Act of 1946, amended (7 U.S.C. 427, 1621), the Food and Agriculture Act of 1977, as amended (7 U.S.C. 1281 note), the Food Security Act of 1985 (7 U.S.C. 3101 note), and the Food, Agriculture, Conservation, and Trade Act of 1990 (7 U.S.C. 1421 note).

ARS is responsible for conducting research on:

- * Soil, Water and Air Sciences
- * Plant Sciences
- * Animal Sciences
- * Commodity Conversion and Delivery
- * Human Nutrition
- * Integration of Agricultural Systems

The research applies to a wide range of goals; commodities; natural resources; fields of science; and geographic, climatic and environmental conditions.

As the Department of Agriculture's in-house research agency, ARS has major responsibilities for conducting and leading the national agricultural research effort. ARS provides initiative and leadership by providing:

- * Research on broad regional and national problems.
- * Research to support Federal action and regulatory agencies.
- * Expertise to meet national emergencies.
- * Research support for international programs.
- * Scientific resource to the Executive Branch and Congress.

The mission of ARS research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the need to: (1) manage and use the Nation's soil, water, air, and climatic resources, and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living in rural America; and (5) strengthen the Nation's balance of payments.

ARS' Headquarters offices are located in Washington, D.C. metropolitan area. The field activities are managed on a national basis through eight Area offices. Research is conducted at field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

As of September 30, 1993, there were 6,682 full-time employees and 1,168 other than full-time employees. Of the total, 494 full-time employees and 23 other than full-time employees, worked in the Headquarters offices.

Under the proposed reorganization, this Agency will be merged into the newly established Agricultural Research and Education Service.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff-Years

1993 Actual and Estimated, 1994 and 1995						
Item	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Direct Appropriation:						
Agricultural						
Research Service....	\$660,667,000:	7,953:	\$683,901,000:	7,910:	\$701,218,000:	7,762
Buildings and Facilities.....	34,514,000:	--:	32,743,000:	--:	25,700,000:	--
Total, Appropriation..	695,181,000:	7,953:	716,644,000:	7,910:	726,918,000:	7,762
Deduct Allotments to Other Agencies:						
Forest Service.....	-345,255:	--:	-361,000:	- -:	-361,000:	--
Net.....	694,835,745:	7,953:	716,283,000:	7,910:	726,557,000:	7,762
Allocations from:						
Hazardous Waste Mgmt.	1,855,000:	--:	1,233,000:	--:	5,356,000:	--
Reimbursements from other USDA						
Appropriations:						
Agricultural						
Marketing Service....	292,771:	1:	320,000:	1:	320,000:	1
Animal and Plant Health Inspection Service.....	7,982,780:	50:	8,722,000:	49:	8,722,000:	48
Federal Grain Inspection Service..	238,927:	2:	261,000:	2:	261,000:	2
National Agricultural Library.....	428,347:	2:	468,000:	2:	468,000:	2
Forest Service.....	1,564,553:	3:	1,709,000:	3:	1,709,000:	3
Food Safety and Inspection Service..	1,325,772:	3:	1,448,000:	3:	1,448,000:	3
Extension Service	75,284:	1:	82,000:	1:	82,000:	1
Office of International Cooperation and Development.....	1,496,860:	2:	1,635,000:	2:	1,635,000:	2
Soil Conservation Service.....	708,492:	2:	774,000:	2:	774,000:	2
Cooperative State Research Service....	309,946:	1:	339,000:	1:	339,000:	1
Miscellaneous Reimbursements.....	99,436:	2:	109,000:	2:	109,000:	2
Total, Other USDA Funds.....	16,378,168:	69:	17,100,000:	68:	21,223,000:	67
Other Federal Funds:						
Department of Defense:	924,814:	3:	1,010,000:	3:	1,010,000:	3
Department of Energy:	786,460:	2:	859,000:	2:	859,000:	2
Department of Health and Human Services...	25,000:	--:	27,000:	--:	27,000:	--
Department of Interior.....	521,656:	2:	570,000:	2:	570,000:	2
Department of State.....	76,830:	1:	84,000:	1:	84,000:	1

Available Funds and Staff-Years

1993 Actual and Estimated, 1994 and 1995						
Item	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Other Federal Funds						
(continued)						
Environmental						
Protection Agency...	\$1,488,159:	3:	\$1,626,000:	3:	\$1,626,000:	3
Nat'l Aeronautics &						
Space Administration:	170,904:	1:	187,000:	1:	187,000:	1
Miscellaneous						
Reimbursement.....	2,334,402:	--:	2,550,000:	--:	2,550,000:	--
Total, Other Federal						
Funds.....	6,328,225:	12:	6,913,000:	12:	6,913,000:	12
Non-Federal Funds:						
State of California..	405,048:	2:	443,000:	2:	443,000:	2
Binational Agri-						
culture Research						
& Development						
Agreement (BARD)...	354,831:	2:	388,000:	2:	388,000:	2
Quarters and						
Subsistence.....	189,217:	--:	207,000:	--:	207,000:	--
North Carolina State						
University	283,964:	1:	310,000:	1:	310,000:	1
Cotton Inc.	238,247:	1:	260,000:	1:	260,000:	1
Florida Department of						
Natural Resources ..	129,883:	1:	142,000:	1:	142,000:	1
Florida Department of						
Environment						
Regulation.....	44,999:	--:	49,000:	--:	49,000:	--
Texas A&M Univ.Agric.						
Experiment Station	63,875:	1:	70,000:	1:	70,000:	1
Miscellaneous						
Reimbursements.....	2,151,722:	--:	2,351,000:	--:	2,351,000:	--
Total, Non-Federal						
Funds.....	3,861,786:	8:	4,220,000:	8:	4,220,000:	8
Miscellaneous						
Contributed Funds..	9,489,267:	53:	11,500,000:	52:	11,500,000:	51
Total, Agricultural						
Research Service.....	730,892,19:	8,095:	756,016,000:	8,050:	770,413,000:	7,900

Agricultural Research Service

Permanent Positions by Grade and Staff-Year Summary
1993 Actual and Estimated 1994 and 1995

Grade	1993 Actual			1994 Estimate			1995 Estimate (1)		
	Hdqtrs	Field	Total	Hdqtrs	Field	Total	Hdqtrs	Field	Total
ES-6	1	--	1	1	--	1	1	--	1
ES-5	7	7	14	7	7	14	7	7	14
ES-4	--	11	11	--	11	11	--	11	11
ES-3	1	5	6	1	5	6	1	5	6
ES-2	--	5	5	--	5	5	--	5	5
ES-1	4	13	17	4	13	17	4	13	17
GS/GM-15	50	417	467	50	417	467	49	413	462
GS/GM-14	36	557	593	36	557	593	35	549	584
GS/GM-13	100	697	797	100	692	792	98	679	777
GS-12	104	635	739	105	627	732	103	609	712
GS-11	12	737	749	13	727	740	12	708	720
GS-10	2	17	19	2	17	19	2	15	17
GS-9	16	794	810	18	788	806	16	775	791
GS-8	2	345	347	2	343	345	2	338	340
GS-7	57	688	745	60	680	740	57	668	725
GS-6	94	593	687	99	585	684	96	583	679
GS-5	47	625	672	50	617	667	48	609	657
GS-4	12	268	280	14	266	280	12	261	273
GS-3	2	84	86	4	82	86	4	77	81
GS-2	--	66	66	--	66	66	--	66	66
GS-1	11	59	70	13	57	70	12	58	70
Positions at rates Established by Act June 20, 1958 (U.S.C. 3104) (ST).....	--	22	22	--	22	22	--	20	20
Grades Established under Foreign National Pay Plan Manual..	--	12	12	--	12	12	--	11	11
Ungraded Positions....	3	686	689	4	680	684	3	667	670
Total Permanent Positions....	561	7,343	7,904	583	7,276	7,859	562	7,147	7,709
Unfilled Positions end-of-year	-47	-772	-819	-47	-772	-819	-47	-772	-819
Permanent Employment end-of-year	514	6,571	7,085	536	6,504	7,040	515	6,375	6,890
Staff Years:	563	7,532	8,095	582	7,468	8,050	561	7,339	7,900

(1) Number of positions and grade levels are distributed on a prorata basis to meet the goals of ARES realignment.

AGRICULTURAL RESEARCH SERVICE

CLASSIFICATION BY OBJECTS1993 Actual, and Estimated 1994, and 1995

	<u>1993 Actual</u>	<u>1994 Estimated</u>	<u>1995 Estimated</u>
Personnel Compensation:			
Headquarters.....	\$23,984,133	\$25,776,882	\$25,465,437
Field.....	<u>283,685,355</u>	<u>293,344,118</u>	<u>296,433,563</u>
11 Total Personnel Compensation.....	307,669,488	319,121,000	321,899,000
12 Personnel Benefits.....	65,993,691	69,144,000	69,644,000
13 Benefits for former employees..	<u>685,512</u>	--	--
Total Pers. Comp. & Benefits.....	374,348,691	388,265,000	391,543,000
Other Objects:			
21 Travel and transportation of persons.....	10,966,998	11,148,000	11,621,000
22 Transportation of things.....	1,062,787	1,095,000	1,142,000
23.2 Rent paid to others	1,313,041	1,339,000	1,397,000
23.3 Communications, utilities and miscellaneous charges....	29,381,959	29,946,000	31,212,000
24 Printing and reproduction.....	1,389,442	1,414,000	1,474,000
25.1 Consultant services	0	115,000	115,000
25.2 Other Services	85,984,615	88,042,000	91,699,000
25.3 Purchases of goods and services from Government accounts	27,796,580	28,931,000	29,415,000
25.4 Operation of GOCOs	27,580,504	28,704,000	29,185,000
25.5 Research and development contracts	34,672,301	36,088,000	36,689,000
26 Supplies and materials.....	48,792,377	51,153,000	53,317,000
31 Equipment.....	32,892,409	35,011,000	37,588,000
32 Lands and Structures.....	6,836,702	8,166,000	6,729,000
41 Grants, subsidies, and contributions.....	<u>13,938,716</u>	<u>16,163,000</u>	<u>13,092,000</u>
Total Other Objects.....	<u>322,608,431</u>	<u>337,315,000</u>	<u>344,675,000</u>
Total Obligations.....	<u>696,957,122</u>	<u>725,580,000</u>	<u>736,218,000</u>

Position Data:

Average Salary, ES positions.....	\$101,912	\$106,000	\$107,048
Average Salary, GM/GS positions....	38,027	39,549	39,944
Average Grade, GM/GS positions.....	9.44	9.44	9.44
Average Salary of Ungraded positions.....	34,939	36,336	36,670

Note: Includes obligations for both Salaries and Expenses and Buildings and Facilities accounts.

PROPOSED LANGUAGE CHANGES
AGRICULTURAL RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Salaries and Expenses:

For necessary expenses to enable the Agricultural Research Service to perform agricultural research and demonstration relating to production, utilization, marketing, and distribution (not otherwise provided for), home economics or nutrition and consumer use, and for acquisition of lands by donation, exchange, or purchase at a nominal cost not to exceed \$100, [\$692,469,000] \$698,718,000: Provided, That appropriations hereunder shall be available for temporary employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$115,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That hereafter appropriations available to the Department of Agriculture can be used to provide financial assistance to the organizers of national and international conferences, if such conferences are in support of agency programs: Provided further, That appropriations hereunder shall be available for the operation and maintenance of aircraft and the purchase of not to exceed one for replacement only: Provided further, That appropriations hereunder shall be available to conduct marketing research: Provided further, That appropriations hereunder shall be available pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of buildings and improvements, but unless otherwise provided, the cost of constructing any one building shall not exceed \$250,000, except for headhouses or greenhouses which shall each be limited to \$1,000,000, and except for ten buildings to be constructed or improved at a cost not to exceed \$500,000 each, and the cost of altering any one building during the fiscal year shall not exceed 10 per centum of the current replacement value of the building or \$250,000, whichever is greater: Provided further, That the limitations on alterations contained in this Act shall not apply to modernization or replacement of existing facilities at Beltsville, Maryland: Provided further, That the foregoing limitations shall not apply to replacement of buildings needed to carry out the Act of April 24, 1948 (21 U.S.C. 113a): Provided further, That the foregoing limitations shall

1 not apply to the purchase of land [or the construction of facilities as may be necessary for the relocation of the United States Horticultural Crops Research Laboratory at Fresno to Parlier, California, and the relocation of the laboratories at Behoust, France and Rome, Italy to Montpellier, France, including the sale or exchange at fair market value of existing land and facilities at Fresno, California and Behoust, France; and the Agricultural Research Service may lease such existing land and facilities from the

2 purchasers until completion of the replacement facilities and the foregoing limitations shall not apply to the purchase of land at Weslaco, Texas] at Parlier, California and Grand Forks, North Dakota: Provided further, That not to exceed \$190,000 of this appropriation may be transferred to and merged with the appropriation for the Office of the Assistant Secretary for Science and Education for the scientific review of international issues involving agricultural chemicals and food additives: Provided further, That funds may be received from any State, other political subdivision, organization, or individual for the purpose of establishing or operating any research facility or research project of the Agricultural Research Service, as authorized by law.

Special func: To provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field, \$2,500,000.

The first change deletes language providing for the purchase of land or the construction of facilities for the relocation of the Horticultural Crop and Water Management Research Laboratory from Fresno to Parlier, California; relocation of the European Biocontrol Laboratory facilities to Montpellier, France; and the purchase of land at Weslaco, Texas. These provisions will not be required in the FY 1995 language since these lands have been acquired and planning for the construction of these new facilities is underway.

The second change provides authorization for the purchase of land at (1) Parlier, California, for an additional 22-acre parcel to be used as a growout site to improve the quality of seed for the Nation's germplasm base. Seed longevity in storage depends upon the quality of seed entering storage. Seed quality can be improved by growing the seed at this particular site which affords the best environmental growing conditions. This land was not available for sale when the 104-acre parcel for the new laboratory was acquired in FY 1992; and (2) Grand Forks, North Dakota, for use as parking facilities of volunteers participating in human nutrition studies at the Grand Forks Human Nutrition Center. The lack of parking jeopardizes the safety of these volunteers especially during severe winter weather.

AGRICULTURAL RESEARCH SERVICE

Appropriation Act, 1994.....	\$694,969,000
Budget Estimate, 1995.....	<u>701,218,000</u>
Increase in Appropriation.....	<u>+6,249,000</u>

Adjustments in 1994:

Appropriation Act, 1994.....	\$694,969,000
Transfer to Human Nutrition Information Service.....	<u>-11,068,000</u> a/
Adjusted base for 1994.....	\$683,901,000
Budget Estimate, 1994.....	<u>701,218,000</u>
Increase over adjusted 1994.....	<u>+17,317,000</u>

a/ Permanent transfer to Human Nutrition Information Service in accordance with Reorganization Plan No. 2 of 1953 7 U.S.C. 2201, and USDA Secretary's Memorandum dated September 30, 1993, No. 1020-39, Section 2b.

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Projects</u>	<u>1994 Estimated</u>	<u>Pay Cost</u>	<u>Program Changes</u>	<u>Program Redirections</u>	<u>1995 Estimated</u>
1. Research on soil, water, and air sciences...	\$ 84,882,000	\$ +546,000	\$-1,126,000	-\$993,000	\$ 83,309,000
2. Research on plant sciences....	247,775,000	+1,592,000	+1,831,000	-2,516,000	248,682,000
3. Research on animal sciences.....	115,513,000	+742,000	-4,225,000	-390,000	111,640,000
4. Research on commodity conservation and delivery..	138,267,000	+888,000	+13,692,000	+3,899,000	156,746,000
5. Human nutrition research....	50,713,000	+188,000	+3,575,000	- -	54,476,000
6. Integration of agricultural systems.....	28,460,000	+183,000	-569,000	- -	28,074,000
7. Repair and main- tenance of facilities..	17,362,000	- -	- -	- -	17,362,000
8. Contingencies..	<u>929,000</u>	<u>- -</u>	<u>- -</u>	<u>- -</u>	<u>929,000</u>
Total Available..	<u>683,901,000</u>	<u>+4,139,000</u>	<u>+13,178,000</u>	<u>- -</u>	<u>701,218,000</u>

Project Statement - Current Law
(on basis of adjusted appropriation)

PROJECT	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	AMOUNT	Staff Years	AMOUNT	Staff Years		AMOUNT	Staff Years
1. Research on soil, water, and air sciences....	\$83,185,814	937	\$84,882,000	933	-\$1,573,000 (1)	\$83,309,000	915
2. Research on plant sciences....	244,074,256	3,350	247,775,000	3,331	+907,000 (2)	248,682,000	3,269
3. Research on animal sciences....	108,898,741	1,584	115,513,000	1,576	-3,873,000 (3)	111,640,000	1,546
4. Research on commodity conversation and delivery	128,042,799	1,656	138,267,000	1,646	+18,479,000 (4)	156,746,000	1,616
5. Human nutrition re-search.....	51,183,455	224	50,713,000	223	+3,763,000 (5)	54,476,000	219
6. Integration of agricultural systems....	25,652,227	202	28,460,000	201	-386,000 (6)	28,074,000	197
7. Repair and maintenance of facilities.....	17,064,876		17,362,000		- -	17,362,000	
Contingencies	a/		929,000		- -	929,000	
Unobligated balance.....	2,564,832		- -	- -	- -	- -	
Total, available or estimate....	660,667,000	7,953	683,901,000	7,910	+17,317,000	701,218,000	7,762
Transfer to the Office of the Secretary.....	212,000		- -				
Transfer to the Human Nutrition Information Service.	- -		11,068,000				
Total Appropriation..	660,879,000	7,953	694,969,000	b/			

a/ Obligations incurred under the Research Contingency Fund in 1993 amount to \$898,523 and are reflected in the program activities listed above.

b/ A request has been submitted to the Congress to rescind \$16,233,000 of the total 1994 appropriation.

AGRICULTURAL RESEARCH SERVICE

Explanation of Program

Under the Agriculture, Rural Development and Related Agencies Appropriations, ARS performs research to:

- * Manage and enhance the Nation's soil, water, and atmospheric resources to optimize agricultural productivity and environmental quality. Research is conducted to develop the technology for assessing and predicting long-term changes in the quantity and quality of the Nation's soil, water, and atmospheric resources; to provide the technology needed for improving, protecting, and restoring the productive capacity of agricultural soils; to develop improved soil and water management systems and practices; and to optimize interactions of climate with soil, water, crops, and their management and through better management, enhance the environment.
- * Maintain and increase the productivity and quality of crop plants. Research is conducted on the: collection and preservation of plant genetic resources; use and modification of these genetic resources to develop new improved high-quality, pest-resistant, stress-tolerant crop varieties to satisfy domestic and export needs; production practices and crop management systems which increase production efficiency and help protect the environment; methods of biological control and other pest management practices to reduce crop losses from insects, diseases, nematodes, and weeds; biology of economic plants and major pests to better understand the biochemistry and function of living organisms; mapping of important genes of major crop plants; and new and alternate high-value crops particularly for small farm operations.
- * Increase the productivity of animals and the quality of animal products. Research is conducted to increase the genetic capacity of animals for production; to improve the efficiency of reproduction and reproduction-related biological processes; to improve animal nutrition and feed efficiency to increase productivity and product quality; to develop ways to prevent or control losses from diseases, parasites, and toxicants and other substances which limit animal performance and reduce the quality of animal products; to develop means for controlling insects, ticks, and mites that affect animals and man; and to devise means for improving and integrating procedures and facilities for production and transport of animals to increase productivity, reduce costs, and enhance animal well-being.
- * Achieve maximum use of agricultural commodities in domestic markets and export. Research is conducted to maintain and improve the economic viability and competitiveness of U.S. food, feed and industrial products and commodities in the current global market by: developing the knowledge and means to improve quality and performance characteristics, to meet consumer safety criteria, and eliminate trade barriers; by providing the knowledge and technologies needed by action and regulatory agencies to assure quality and safety; by devising economic, environmentally benign, safe processing concepts; and by expanding domestic and export market opportunities through the development of value-added food and nonfood products.
- * Promote optimum human health and well-being through improved nutrition and family resource management. Research is conducted to define the cellular and molecular functions, requirements, and interactions of nutrients for humans at all stages of the life cycle; to explore genetic diversity and individual variation in nutrient needs; to develop methods for determining the nutrient content of agricultural commodities and processed foods

JUSTIFICATION OF INCREASES AND DECREASES

The Administration proposes a net increase of \$17.317 million for programs of the Agricultural Research Service. This budget reflects a number of important changes, including efficiencies to be gained through the streamlining of research and extension activities within USDA and the continuing need to focus limited resources on the highest priority problems faced by the agricultural sector. Streamlining of the Agricultural Research Service includes the closure of lower priority laboratory locations. These actions will enable the Agency to redirect funds from administrative overhead into bench level research directed at solving farm and ranch problems. Overhead rates at remaining laboratories will be lowered as a result of operating facilities at higher levels of occupancy. Further, the planned consolidation of administrative functions for research, extension and economics programs will result in staff year savings. Governmentwide goals to reduce positions at grades GS-14 and above, to reduce the supervisory ratio and to make proportionately larger reductions at headquarters are reflected in the budget proposed for ARS.

- (1) A net decrease of \$1,573,000 for research on Soil, Water, and Air Sciences consisting of:
 - (a) An increase of \$546,000 for anticipated pay costs.
 - (b) An increase of \$934,000 which reflects a 2.6% increase in non-salary costs.
 - (c) An increase of \$176,000 for anticipated SES lump-sum costs.
 - (d) A decrease of \$929,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$929,000.

Nature of Change. In order to achieve these savings, ARS will reduce discretionary expenses by \$929,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) A decrease of \$2,307,000 which reflects savings from the closeout of research laboratories and reductions in lower priority research projects.

Need for Change. Streamlining the USDA research activities will result in savings which will be directed to achieve critical research initiatives. The budget recommendations include the elimination of selected research locations and the termination and reduction of specific lines of ongoing research. More effective utilization of remaining laboratories will result in lower overhead costs. Specific locations and research projects were selected to provide additional resources necessary to carry out more critical research impacting food safety, methyl bromide alternatives and pesticide reduction.

Nature of Change. Research at the following locations is proposed for termination:

Fairbanks, Alaska (\$729,500)

The primary thrust of the program has been the development of a grain cropping system for Alaska. That task was successfully completed, but market conditions have prevented the development of a significant grain

farming enterprise. More recently, research has shifted to the measurement of greenhouse gases, for which the location is poorly suited in terms of the specialization of the personnel, and work on frozen soils. Frozen soil work is carried on elsewhere in Minnesota and Washington, making the program in Fairbanks of low priority.

Brawley, California (\$306,000)

Brawley serves primarily as a staging area for field work in soil and water management, entomology, and crop production directed from other ARS laboratories such as Riverside, Fresno, and Salinas, California; and Phoenix, Arizona. The facilities duplicate those in the Imperial Valley of the University of California, and much of the work is directed at unique problems in one section of California. The research is of relatively low priority given other ARS priorities and existing fiscal constraints. To the extent desirable, field work can be continued in the Valley from remote locations without maintaining the local facilities.

El Reno, Oklahoma (\$299,700)

The mission of the Grazinglands Research Facility at El Reno is to increase the efficient production of lean red meat from forages by increasing the quantity and quality of forages. A soil/forage/animal systems research approach to meat production is the main research emphasis at El Reno. In addition, facilities are old and badly in need of upgrading/modernization, especially the feedlots, fences, other infrastructure, etc. Similar research is being conducted by ARS at Clay Center, Nebraska and Miles City, Montana. The research programs at these locations are better focused, more productive and can meet the research needs of clients located in different ecological production areas of the United States.

Sidney, Montana (\$741,600)

The mission of the location is to develop sustainable farming systems for the Northern Great Plains, including dryland and irrigated crop production. As a satellite from Bozeman, the unit is actively working on biocontrol of leafy spurge and other range weeds. The laboratory has made significant contributions to water conservation, erosion control, and crop production over the years. However, similar work is carried on at Bozeman, Montana; Mandan, North Dakota; Cheyenne, Wyoming; and Akron, Colorado. The Agency can serve the needs of the Northern Plains effectively from these remaining four locations.

Headquarters and Area Management Reduction (\$230,200)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

(f) An increase of \$1,000,000 for research on Co-Composting Wastes.

Need for Change. Increasing concentrations of people in cities and animals in feedlots, and public concern regarding hazards posed by municipal, industrial and agricultural wastes have resulted in dramatic increases in the costs of waste disposal. In 1980, costs for disposal of wastes at landfills in the U.S. averaged about \$10 per ton. By 1990, they had risen to nearly \$40 per ton. By the year 2000, they are expected to exceed \$100 per ton in many areas.

Composting has been advocated by the Environmental Protection Agency (EPA) as a safe and beneficial practice for converting sewage sludges to beneficial soil conditioners and biofertilizers. Essential plant nutrients and potentially beneficial soil amendments may be obtained from municipal solid wastes, coal-fired power plant wastes and manures from animal production, each of which is generated at rates of over 100 million tons per year. However, when applied directly to soils, or even as single component composts, these materials are often so soluble, concentrated or reactive that they contaminate the water, air, or soil. Some are too wet or too dry, or too dense or too fluffy, to be applied with existing equipment or to stay in place when applied to the soil surface where they would provide the most benefit.

Co-composting, or combining and composting wastes from different sources appears to have potential for making valuable and usable resources from these wastes. However, guidelines for co-composting these wastes to overcome objectionable characteristics are not available.

Nature of Change. Research will be expanded in the following areas:

- o Develop guidelines for co-composting and use of municipal, industrial and agricultural wastes to:
 - Stabilize wastes so they will not contaminate the air or ground water during composting and storage, and
 - Maintain short and long-term solubilities of elements in compost-soil mixtures in ranges which enhance the environment, productive potential of soil, and quality of crops.
- o Develop means for incorporating and growing beneficial organisms in composts to help control insects, diseases, nutrient deficiencies, and other stresses which cause crop failure.
- o Determine the physical, biological, and socio-economic factors essential to changing these wastes into products of dependable quality which will be profitable for manufacturers and users.
- o Develop specific guidelines for on-farm composting which will enable farmers to use municipal and industrial wastes and produce co-composts for both their own use and for sale.

(g) A redirection of \$993,000 for research on higher priority projects.

Need for Change. ARS' research priorities are continually examined to ensure that they meet the needs of producers and consumers. Areas of increased importance which require additional resources through redirection are: food safety, methyl bromide alternatives, and pesticide reduction.

Nature of Change. The redirection of resources between major activities is as follows:

From Soil, Water, and Air Sciences:

Potato production systems,
Prosser, WA (-\$588,000)

Plant-soil-microbe interactions,
Beltsville, MD (-\$149,000)

To Plant Sciences:

Sustainable cropping systems for the
Intermountain area, Prosser, WA
(+\$588,000)

Soil management for control of
pathogens, Beltsville, MD (+\$149,000)

Residue decomposition,
Beltsville, MD (-\$122,000)

Soil management for control of
pathogens, Beltsville, MD (+\$122,000)

Soil mycorrhizal fungi,
Corvallis, OR (-\$134,000)

Soil management for control of
pathogens, Corvallis, OR (+\$134,000)

(2) A net increase of \$907,000 for research on Plant Sciences consisting of:

- (a) An increase of \$1,592,000 for anticipated pay costs.
- (b) An increase of \$2,725,000 which reflects a 2.6% increase in non-salary costs.
- (c) An increase of \$513,000 for anticipated SES lump-sum costs.
- (d) A decrease of \$2,712,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$2,712,000.

Nature of Change. In order to achieve these savings, ARS will reduce discretionary expenses by \$2,712,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) A decrease of \$9,695,000 which reflects savings from the close-out of research laboratories and reductions in lower priority research projects.

Need for Change. Streamlining the USDA research activities will result in savings which will be directed to achieve critical research initiatives. The budget recommendations include the elimination of selected research locations and the termination and reduction of specific lines of ongoing research. More effective utilization of remaining laboratories will result in lower overhead costs. Specific locations and research projects were selected to provide additional resources necessary to carry out more critical research impacting food safety, methyl bromide alternatives and pesticide reduction.

Nature of Change. Research at the following locations is proposed for termination:

Oxford, North Carolina (\$1,766,800)

Tobacco funds at Oxford are used for a variety of research projects to include breeding of improved tobacco varieties, molecular and biochemical control of nitrogen assimilation in tobacco and other plants, and control of insect and disease pests. While this research has been meaningful and worthwhile, there now is a need to terminate tobacco research at this location. Many of the original research objectives have been accomplished, production problems of the tobacco industry are now much less acute than they were previously, and the tobacco growers are diversifying their operations to other crops. Much of the research now being conducted by ARS scientists relate to local tobacco production problems which can be considered as the responsibility of individual States.

Lexington, Kentucky (\$1,548,500)

Current funds at Lexington are divided between an inhouse research project on use of the tobacco plant to study carbon and nitrogen metabolism and a cooperative project with the University of Kentucky. Funds provided to the University of Kentucky are used to support a variety of research projects to include breeding of improved tobacco varieties, pest resistance, cultural methods, and chemical composition of the tobacco plant. While this research has been productive and useful in the past, it now can be terminated. Most of the original research objectives have now been accomplished and there are other production and marketing problems with other important economic crops that have a higher national priority. Much of the research now being conducted by the University of Kentucky with Federal funds is directed toward solving tobacco production problems of the State, and as such, should be funded with State funds.

In addition, a small program in forages at Lexington would be eliminated. The forage program is narrowly focused on local problems and can be eliminated.

Chatsworth, New Jersey (\$514,400)

Research at Chatsworth is on breeding of blueberries, and on improved methods of disease control in blueberries and cranberries. Excellent progress has been made and both the cranberry and blueberry industries are thriving and expanding. To a large degree, the original objective of this research has been accomplished. ARS has introduced 51 new improved varieties of high bush blueberries over the last 50 years and these are mainly tolerant of major disease problems. Largely through ARS research, disease problems of cranberries are now greatly reduced. Since the cranberry and blueberry industries are thriving and these crops are major agricultural industries in the State of New Jersey, it is appropriate for the industries themselves and the State to continue whatever research may be required in the future. Some blueberry breeding will continue at Beltsville, Maryland, and the National Blueberry Repository will continue to be maintained at Corvallis, Oregon.

Delaware, Ohio (\$263,400)

Current research is on the development of more accurate ways to screen seedling trees for resistance to disease pests, potential use of biological methods of control of the Dutch elm disease, and improved methods of propagation of improved elm tree varieties. This research is largely devoted to research on the American elm. The research has been worthwhile and beneficial but there now is a need to discontinue this research. ARS has released seven new improved elm varieties with resistance to the Dutch elm disease and nurserymen are successful in propagating these new varieties. Furthermore, scientists at the National Arboretum, Washington, D.C., have a very active tree breeding program and can continue to evaluate existing elm selections for introduction to the nursery industry if there is a need to do so. The attempt to find a biological means of control for the Dutch elm disease has not been successful and is not considered to be feasible at this time.

Beltsville, Maryland (\$397,600)

Tobacco research at Beltsville involves using the plant as a model plant system for research on regulation and expression of genes involved in accumulation of seed oil and protein in economic crops and for development of improved tissue culture technologies. This research has been useful but can now be terminated. Major advances have been made in genetic

engineering and tissue culture technologies during the last few years and there are now other plants such as soybean, wheat, rice, and corn that can be used as crop model systems. It is more appropriate to use these other crops for basic research studies as new genetic materials derived from the research programs can be used directly to enhance yield, composition, nutritional quality, and other important plant characteristics.

El Reno, Oklahoma (\$444,800)

The mission of the Grazinglands Research Facility at El Reno is to increase the efficient production of lean red meat from forages by increasing the quantity and quality of forages. A soil/forage/animal systems research approach to meat production is the main research emphasis at El Reno. In addition, facilities are old and badly in need of upgrading/modernization, especially the feedlots, fences, other infrastructure, etc. Similar research is being conducted by ARS at Clay Center, Nebraska and Miles City, Montana. The research programs at these locations are better focused, more productive and can meet the research needs of clients located in different ecological production areas of the United States.

East Grand Forks, Minnesota (\$960,300)

The Potato Research Laboratory at East Grand Forks is a partner in a Federal-State-private industry collaboration to improve quality and reduce postharvest losses for the farmer, handler and processor. The laboratory has successfully resolved postharvest handling and storage issues by defining the relevant variables and developing an expert system to guide producers and processors in storage loss prevention. Current research emphasis is on variety evaluation for end use quality, and identification of biorational means for controlling sprouting. The latter research is also addressed at the Agency's Northern Crop Science Laboratory in Fargo, North Dakota, where there is the critical mass of scientific disciplines lacking at the East Grand Forks location. Operating funds at this location are minimal and the Agency does not have sufficient resources to provide additional support, especially when issues of newly emerging potato diseases are seriously impacting farmer returns and requiring Agency attention.

Houma, Louisiana (\$1,382,900)

Research in Houma is exclusively on the breeding and culture of sugarcane. Emphasis is on the development of new improved varieties, the use of genetic engineering procedures to introduce new genes or genetic material into existing varieties, control of weed populations, and improved methods of insect and disease control. This research has been very successful and the yield of sugar/acre has increased over the years through use of ARS varieties. Over the last 13 years, ARS has released 30 new varieties, some of which have been jointly released with Louisiana State University. Inasmuch as all the research now conducted at this ARS location is exclusively to benefit the Louisiana sugarcane industry, it is appropriate that the State assume a larger role in providing for the research needs of the industry.

Suffolk, Virginia (\$666,700)

The mission at Suffolk is to develop peanut germplasm and cultivars with desirable agronomic and end use characteristics, to devise effective control strategies for foliar diseases, and develop optimum peanut and corn production systems. Research emphasis is on virginia-type peanuts grown almost exclusively in Virginia and North Carolina is part of a

Federal-State collaborative peanut research effort in these States. Though virginia-type peanuts command a strong position in the European market, domestic markets for snack nut products have plateaued and southeastern runner-type peanuts are preferred for peanut butter products. Both markets are affected by consumer desire to reduce fat intake. Closure of this location would create an opportunity for commercial entry into peanut cultivar development and permit the Agency to concentrate efforts on its postharvest quality program for virginia-type peanuts at Raleigh, North Carolina.

Brownwood, Texas (\$473,100)

The objective of the research at Brownwood is to evaluate pecan germplasm and introduce improved varieties. In recent years, most of the new experimental plantings have been cooperatively established with Texas A&M University at College Station. This research has been very productive and ARS has introduced 18 new improved varieties which are now widely grown throughout the pecan belt. In view of the need to address other agricultural problems of high national priority, there is now a need to terminate this research. The new ARS varieties are widely grown and there is reduced need for this research. About 40 percent of the U.S. pecan crop is produced from native seedling trees. This figure has not changed much over the years. With the availability of existing improved varieties and the lack of expansion of plantings of improved varieties in the U.S., the future need for additional improved varieties is not considered of high national priority. The collection of unique pecan germplasm now located at Brownwood will continue to be maintained.

Jackson, Tennessee (\$166,900)

Current research objectives at Jackson are to develop enhanced soybean germplasm with resistance to the cyst nematode and to study the influence of resistant germplasm on the development of new pathogenic races of the nematode. This research has been very successful but there is now a need to terminate this research at this location. It is more appropriate to conduct the research at Stoneville, Mississippi, as an objective of an existing research program on breeding improved soybean varieties. Consolidation of the research at Stoneville would help strengthen the existing ARS-Mississippi cooperative program at Stoneville where there is a large number of scientists and the opportunity for interdisciplinary research.

Miami, Florida (\$165,500)

The Subtropical Horticultural Research Laboratory in Miami has two distinct programs -- acquisition, maintenance, and distribution of subtropical and tropical germplasm of agricultural importance, and development of technologies to maintain quality and eliminate quarantine barriers for subtropical and tropical fruits and vegetables. Operating funds at this location no longer meet Agency standards and postharvest research has been severely limited due to loss of tropical and subtropical fruit orchards in Hurricane Andrew. Reestablishment of fruit production in this area in the long-term is questionable. Facility disruption by the hurricane and unrelenting urban encroachment dictate consolidation of these activities at other relevant Agency locations. Transfer of the germplasm to Agency facilities at Mayaguez, Puerto Rico, and Hilo, Hawaii, will consolidate appropriate conservation programs, increase management efficiency and eliminate possibility of frost damage to temperature sensitive materials. Similarly, consolidation of the postharvest programs at Orlando and Gainesville, Florida, will increase the opportunity for the Agency to achieve the disciplinary diversity and critical mass needed to develop alternatives to the postharvest fumigation use of methyl bromide

and improved shelf life of U.S. exports.

Headquarters and Area Management Reduction (\$944,100)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

(f) An increase of \$7,500,000 for research on Pesticide Reduction in Fruits, Vegetables, and Other Crop Production.

Need for Change. The public is increasingly concerned about health and environmental hazards that may result from the use of chemical pesticides for controlling insects and other pests. Food safety concerns of industry and government agencies result in banning or placing rigid use restrictions on an increasing number of pesticides because of perceived or potential hazards. Additionally, insects continue to develop resistance to insecticides, which further limits the availability of suitable insecticides. And, industry is reluctant to make the investments necessary to discover, develop, and demonstrate safety of new pesticides because of the time, risks, and high costs involved. Thus, the need to implement alternative pest control strategies is urgent.

The underlying foundation of most current alternative pest control strategies is integrated pest management programs (IPM) which are carried out on a voluntary basis by farmers using a combination of different measures such as cultural practices, growing resistant varieties, using biological control agents, etc. The overall principle of IPM is reliance on natural control factors to the maximum extent possible. However, in many crop production systems the need to apply pesticides throughout the cropping season to control key pests lessens the impact of natural controls. The outcome is that, without areawide control of key pests, the ultimate dependence of individual growers on pesticides as the major component in the integrated system is not reduced. Furthermore, IPM practiced on a field-to-field or farm-to-farm basis does little to prevent or control pest population buildup in surrounding areas. Most insect pests that require widespread use of pesticides are highly mobile and can readily invade low-population areas from nearby high-density zones.

After several decades of intensive efforts to develop new technologies and strategies for controlling agricultural pests, scientists have made outstanding progress in a number of areas that offer opportunities for achieving pest control at low cost and in an environmentally sound manner. For example:

- o A wide range of insect attractants have been discovered that permit the detection of insects existing at very low population levels; some of the attractants are useful for control.
- o Insect geneticists and entomologists have found new genetic mechanisms that are more effective in inhibiting reproduction than the sterility technique which was previously demonstrated to be effective with certain insect pests.
- o Biologists investigating the behavior of biological agents have obtained basic information that indicates the augmentation of natural biological agents offers much better opportunities for regulating and perhaps even eradicating insect pest populations than had previously been realized.

- o The remarkable progress that insect-rearing specialists have made in the mass production of insects provides greater opportunities for resolving insect pest problems by the rearing and mass release of biological agents, including the development of biological insecticides having a high degree of pest specificity.

Thus, there is a vast store of new information and technology ready to be exploited in order to deal with agricultural pest problems in a more rational and effective manner than has been achieved in the past with reliance on chemical pesticides. The basic strategy that should be employed is one designed to prevent the pest population from reaching damaging levels rather than treatment of a problem after it develops. However, relatively little of the new technology is now being used in this manner. The primary reason is that neither scientists nor pest management organizations have had the resources to adequately transfer the technology. Before farmers or pest management agencies can adopt new pest control procedures for practical application, it will be necessary for research organizations to clearly demonstrate and document that the new technology is feasible, effective, practical, and safe under field conditions.

Largely because of insect mobility, it is not possible to demonstrate the utility of promising new technologies simply by conducting trials on small individual farms of only a few hundred acres when the biological agents used or the pests to be controlled are capable of moving 5, 10, or even 100 miles within a few days or during the growing season. Therefore, depending on the nature of the pest and the control techniques under development, it may be necessary to conduct trials in agricultural regions encompassing thousands of acres of crops or hundreds of square miles of pest habitats. A total systems approach is needed.

There is every reason to believe that technology can be made available to deal with many of the major pest problems by undertaking preventive measures in an organized and coordinated manner and on an area-wide basis.

Nature of Change. Large-scale pilot tests will be undertaken in fruits, vegetables, and other crop production areas in order to properly evaluate and further develop promising pest control technologies and systems such as releasing specific biological agents, using different genetic mechanisms, evaluating the effectiveness of certain attractants, using resistant varieties, and adopting specific cultural practices. Critical insect pests include the Colorado potato beetle, sweetpotato whitefly, diamondback moth, codling moth, phylloxera, aphids, mites, stinkbugs, cucumber beetles, scale insects, loopers, weevils, leaf miners, pear psylla, fall armyworm, corn rootworm, pink bollworm, tobacco budworm, and others. This initiative will address pest species that are responsible for 80 percent of the insecticides and other pesticides currently used in fruits, vegetables, and other crop production.

- o Areawide Systems Approach to Pesticide Reduction and Alternative Pest Control. Large scale tests to prevent and control pests in crop production by areawide management will be initiated. The research will: a) implement the best combinations of current technology, b) identify technology gaps; c) obtain basic ecological data including the role of native biocontrol agents; d) develop procedures for the mass production of specific biological agents; e) produce the biological agents needed for specific experiments; f) execute the trial programs; g) monitor the results; and h) demonstrate cost-effective, efficacious alternative pest control systems for commercial adoption by producers.

An interagency USDA working group for IPM, in consultation with the EPA and FDA, will identify and prioritize food residue and environmental risk problems for guiding ARS' selection of the most critical and technically feasible research programs.

The total cost for each program will likely range from \$2 to \$4 million per year over a period of about five years. Several tests on different pest species at different locations will be conducted simultaneously. The funds appropriated will be revolving in nature. After completing one program, the funds will become available for some other high-priority pilot test. The program will be executed by existing research laboratories and supervised by the existing scientific staff. They will be carried out with the cooperation of appropriate Federal and State pest management agencies, and with the involvement, cooperation, and support of the private sector users of the technologies developed. The public will be the ultimate beneficiary of the program through reduced pesticide use and improved food and environmental safety and quality.

(g) An increase of \$1,000,000 for research on the Agricultural Biodiversity of Wetlands.

Need for Change. Preservation of the nation's agrobiodiversity is essential to have the genetic resources available to meet the challenges of our production systems. Wetland ecosystems form an integral part of most agricultural lands and contribute significantly to their biodiversity. The interrelationships between the flora and fauna found on wetlands is not yet adequately understood or appreciated. This is particularly true of the impacts of management on the vast array of biota that inhabit the complex landscapes of these ecosystems. The impacts of agricultural management practices, such as the application of chemicals, the use of biocontrol activities, cultivation, and the selection of plant germplasm used in cropping systems on the wetlands is not known.

In addition, the Convention on Biological Diversity charges all member countries to increase their capabilities in the areas of conservation and sustainable use. New efforts to develop effective conservation protocols for other life forms, such as those found in wetlands is needed. It is also critical that sustainability be a major criterion in the management of agricultural lands and associated wetlands.

Nature of Change. Research will be conducted on the impacts of agriculture and forestry on the biodiversity of wetlands. Initially, the research will focus on the Mississippi Delta and the Coastal Plains regions. The research will also contribute to the National Genetic Resources Program database with a variety of life forms associated with wetland ecosystems resources. The nation's wetlands contain the highest proportion of biological diversity associated with agriculture. The research will address the following questions:

- o What are the existing impacts of agriculture and forestry on the biodiversity of wetlands?
- o How can the adverse impacts of agriculture and forestry on the biodiversity of wetlands be minimized?
- o How can species and genetic diversity of wetland ecosystems contribute to the sustainability of agriculture and forestry?

(h) An increase of \$2,500,000 for agricultural research in support of United States-Israel Binational Agricultural Research and Development.

Need for Change. An agreement between the U.S. and Israel governments to

establish the United States-Israel Binational Agricultural Research and Development Fund (BARD) was signed in 1977. The purpose was to foster greater cooperation between the two scientific communities for their mutual benefit in advancing agriculture. An initial endowment fund of \$80 million was originally established by equal contributions from Israel and the U.S. Additional funds (\$15 million from each country) were provided to the endowment in FY 1985. However, a reduction in interest rates and an increase in the cost of research has greatly impeded the ability of BARD to adequately meet the needs of the research community.

Nature of Change. The additional funding will be matched by the Israel government and support all aspects of agricultural research within the mission of ARS. Specifically, the funds requested here will not be exclusively available to plant sciences but to all ARS program activities (i.e., soil, water, and air sciences; animal sciences; commodity conversion and delivery; human nutrition; and integration of agricultural systems). These funds will supplement the interest provided by the initial BARD endowment and made available for grants to joint U.S.-Israeli agricultural research projects.

- (i) A redirection of \$2,516,000 for research on higher priority projects.

Need for Change. ARS' research priorities are continually examined to ensure that they meet the needs of producers and consumers. Areas of increased importance which require additional resources through redirection are: food safety, methyl bromide alternatives, and pesticide reduction.

Nature of Change. The redirection of resources between major activities is as follows:

<u>From Plant Sciences:</u>	<u>To Commodity Conversion and Delivery:</u>
Transgenic introduction of novel compounds for insect control, Albany, CA (-\$577,000)	Biochemical basis for resistance to aflatoxin production in tree nuts, Albany, CA (+\$577,000)
Genes associated with flower development, Athens, GA (-\$195,000)	Pathogen reduction in poultry, Athens, GA (+\$195,000)
Pecan research, Athens, GA (-\$242,000)	Fusarium mycotoxin formation/metabolites, Athens, GA (+\$242,000)
Production of peptides, Peoria, IL (-\$415,000)	Biochemical basis for mycotoxin resistance in corn, Peoria, IL (+\$415,000)
Production of value-added seeds, Peoria, IL (-\$274,000)	Biochemical basis for mycotoxin resistance in corn, Peoria, IL (+\$274,000)
Biochemical bases-insect behavior, Albany, CA (-\$404,000)	Methodology to detect and control chemical residues, Albany, CA (+\$404,000)
Improved nutrition quality of legume seed protein, Ithaca, NY (-\$316,000)	Control of translocation of toxic mineral levels in crops, Ithaca, NY (+\$316,000)

Limitations to sucrose accumulation in sugarcane, Weslaco, TX (-\$325,000)	Alternative postharvest quarantine treatments for fruits/vegetables, Weslaco, TX (+\$325,000)
Detection and control strategies of citrus diseases, Orlando, FL (-\$250,000)	Alternative postharvest technologies to meet export requirements, Orlando, FL (+\$250,000)
Citrus/avocado nutrition, Pasadena, CA (-\$287,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA (+\$287,000)
Bioregulation of plant responses, Pasadena, CA (-\$159,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA (+\$159,000)
Experimental bioassay growth systems, Pasadena, CA (-\$65,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA (+\$65,000)

From Soil, Water, and Air Sciences:

To Plant Sciences:

Potato production systems, Prosser, WA (-\$588,000)	Sustainable cropping systems for the Intermountain area, Prosser, WA (+\$588,000)
Plant-soil-microbe interactions, Beltsville, MD (-\$149,000)	Soil management for control of pathogens, Beltsville, MD (+\$149,000)
Residue decomposition, Beltsville, MD (-\$122,000)	Soil management for control of pathogens, Beltsville, MD (+\$122,000)
Soil mycorrhizal fungi, Corvallis, OR (-\$134,000)	Soil management for control of pathogens, Corvallis, OR (+\$134,000)

(3) A net decrease of \$3,873,000 for research on Animal Sciences consisting of:

- (a) An increase of \$742,000 for anticipated pay costs.
- (b) An increase of \$1,270,000 which reflects a 2.6% increase in non-salary costs.
- (c) An increase of \$239,000 for anticipated SES lump-sum costs.
- (d) A decrease of \$1,264,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$1,264,000.

Nature of Change. In order to achieve these savings, ARS will reduce discretionary expenses by \$1,264,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) A decrease of \$4,470,000 which reflects savings from the closeout of research laboratories and reductions in lower priority research projects.

Need for Change. Streamlining the USDA research activities will result in savings which will be directed to achieve critical research initiatives. The budget recommendations include the elimination of selected research locations and the termination and reduction of specific lines of ongoing research. More effective utilization of remaining laboratories will result in lower overhead costs. Specific locations and research projects were selected to provide additional resources necessary to carry out more critical research impacting food safety, methyl bromide alternatives and pesticide reduction.

Nature of Change. Research at the following locations is proposed for termination:

El Reno, Oklahoma (\$356,700)

The mission of the Grazinglands Research Facility at El Reno is to increase the efficient production of lean red meat from forages by increasing the quantity and quality of forages. A soil/forage/animal systems research approach to meat production is the main research emphasis at El Reno. In addition, facilities are old and badly in need of upgrading/modernization, especially the feedlots, fences, other infrastructure, etc. Similar research is being conducted by ARS at Clay Center, Nebraska and Miles City, Montana. The research programs at these locations are better focused, more productive and can meet the research needs of clients located in different ecological production areas of the United States.

Hilo, Hawaii (\$1,477,900)

The mission of the ARS research unit in Hilo is to define the nutrient requirements of shrimp and finfish. Research accomplishments derived from the Oceanic Institute grant since its inception have been demonstration-type reports, with marginal discovery and few peer-reviewed articles. The ARS program is proposed for termination due to lack of funding to support the research program.

Beltsville, Maryland (\$1,289,400)

The mission of the Livestock Insects Laboratory in Beltsville is to discover new knowledge for controlling insects to improve agricultural efficiency, and protect human and animal populations. Various methods are being developed to reduce the destructive effects of flies, mites, ticks, etc., on farm livestock and people. The major researchable problems that justified forming the laboratory have for the most part been solved. In addition, a portion of the current effort is duplicated elsewhere in ARS. These factors, plus old facilities necessitate the reduction of this effort.

Georgetown, Delaware (\$756,200)

The mission of the Poultry Research Laboratory in Georgetown is to improve the lean-to-fat ratio of meat-type poultry. The program focuses on biochemical, genetic, nutritional, and physiological mechanisms concerned in the developmental control of fat and protein deposition. The poultry industry has indicated their priorities and the highest priorities are already being dealt with at other ARS locations. Therefore, duplication of effort is not warranted.

Lewisburg, Tennessee (\$143,900)

The mission of the Dairy Production and Genetics Research Unit in Lewisburg is to conduct research related to problems in the operation of

dairy farmers in the upper South. Areas of research include nutrition, genetics, management, physiology of reproduction, and management of waste materials. Current funding is inadequate to support one scientist. In addition, only Jersey cows are available for research while the U.S. dairy herd is 90+ percent Holstein. Scientific productivity has been poor, (primarily due to lack of funds), and the facilities are old and badly outdated.

Headquarters and Area Management Reduction (\$445,900)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

(f) A redirection of \$390,000 for research on higher priority projects.

Need for Change. ARS' research priorities are continually examined to ensure that they meet the needs of producers and consumers. Areas of increased importance which require additional resources through redirection are: food safety, methyl bromide alternatives, and pesticide reduction.

Nature of Change. The redirection of resources between major activities is as follows:

From Animal Sciences:

To Commodity Conversion and Delivery:

Rangeland weeds, Albany, CA
(-\$390,000)

Methods for toxic residue detection,
Albany, CA (+\$390,000)

(4) A net increase of \$18,479,000 for research on Commodity Conversion and Delivery consisting of:

- (a) An increase of \$888,000 for anticipated pay costs.
- (b) An increase of \$1,520,000 which reflects a 2.6% increase in non-salary costs.
- (c) An increase of \$286,000 for anticipated SES lump-sum costs.
- (d) A decrease of \$1,514,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$1,514,000.

Nature of Change. In order to realize these savings, ARS will reduce discretionary expenses by \$1,514,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) A decrease of \$1,600,000 which reflects savings from the close-out of research laboratories and reductions in lower priority research projects.

Need for Change. Streamlining the USDA research activities will result in the savings which will be directed to achieve critical research initiatives. The budget recommendations include the elimination of selected research locations and the termination and reduction of specific lines of ongoing research. More effective utilization of remaining laboratories will result in lower overhead costs. Specific locations and

research projects were selected to provide additional resources necessary to carry out more critical research impacting food safety, methyl bromide alternatives and pesticide reduction.

Nature of Change. Research at the following locations is proposed to be terminated:

Rotterdam, The Netherlands (\$342,600)

The mission of the Rotterdam laboratory is to conduct research that will contribute to more efficient marketing of U.S. agricultural products in Europe. The program remains underfunded even with a fifty percent reduction in staff. With the maturation of the European market, the mission of this location is essentially accomplished. Thus, if limited agency resources become available, these would best be directed toward issues evolving from the emerging and rapidly expanding market opportunities for U.S. products in the Pacific Rim.

Pasadena, California (\$450,000)

The mission of the Fruit and Vegetable Chemistry Laboratory in Pasadena is to conduct research on the chemistry, biochemistry and physiology of subtropical and citrus crops and products with primary emphasis on quality control and enhancement. Inflation and pay act increases have reduced discretionary funding levels for scientists to highly unacceptable levels and decreases in staffing and retirements have jeopardized adequacy of disciplinary diversity and critical mass. Further, the facility does not meet modern health and safety standards nor the California earthquake codes. Repairs are estimated at several million dollars. The major portion of the citrus quality research can be continued at the Agency's Western Regional Research Center, Albany, California. Other resources can be most effectively utilized at Fresno, California, for research on alternatives to methyl bromide, and at Salinas, California, for vegetable production systems research.

Savannah, Georgia (\$450,000)

The mission of the Stored Product Insects Research and Development Laboratory in Savannah is to develop the means to prevent or reduce insect damage and contamination of agricultural commodities and their products in on-farm storage and in marketing channels. Though the laboratory is adequately funded to conduct its planned research, facilities at Savannah are old, inappropriate for today's research, and in need of costly repairs and modernization. The estimated cost of just bringing them up to modern, safe standards is more than \$3 million. Further, the Agency has underutilized facilities at the U.S. Grain Marketing Research Laboratory, Manhattan, Kansas, and the Insect Attractants, Behavior and Basic Biology Laboratory, Gainesville, Florida. Redirection of the major portion of the resources to these locations would enhance the disciplinary diversity and critical mass at each. Other portions of the resources would be used to strengthen high priority programs on alternatives to methyl bromide and grain quality issues important to export.

Miami, Florida (\$165,500)

The Subtropical Horticultural Research Laboratory in Miami has two distinct programs -- acquisition, maintenance, and distribution of subtropical and tropical germplasm of agricultural importance, and development of technologies to maintain quality and eliminate quarantine barriers for subtropical and tropical fruits and vegetables. Operating funds at this location no longer meet Agency standards and postharvest research has been severely limited due to loss of tropical and subtropical

fruit orchards in Hurricane Andrew. Reestablishment of fruit production in this area in the long-term is questionable. Facility disruption by the hurricane and unrelenting urban encroachment dictate consolidation of these activities at other relevant Agency locations. Transfer of the germplasm to Agency facilities at Mayaguez, Puerto Rico and Hilo, Hawaii, will consolidate appropriate conservation programs, increase management efficiency and eliminate possibility of frost damage to temperature sensitive materials. Similarly, consolidation of the postharvest programs at Orlando and Gainesville, Florida, will increase the opportunity for the Agency to achieve the disciplinary diversity and critical mass needed to develop alternatives to the postharvest fumigation use of methyl bromide and improved shelf life of U.S. exports.

Headquarters and Area Management Reduction (\$191,900)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

- (f) An increase of \$10,000,000 for research to assure the Safety of the Food Supply.

Need for Change. Food safety is a major concern of this nation's consumers. Agriculture's ability to meet food safety standards and maintain consumer confidence is critical. The public is aware that children may die or be permanently disabled from consuming a pathogen (e.g., *E. coli* 0157:H7) in contaminated food. This contributes to heightened consumer awareness of all microbial, parasitic and chemical contamination of food and intensifies the need to assure the safety and quality of both plant and animal derived foods.

The increased concern with human pathogens carried by meat and poultry and their products has dictated that microbial control start with the producer and that new methods be developed and implemented to prevent microbial contamination at the source, that is, in the live animal or bird. Small numbers of microorganisms on carcasses which cannot be readily detected during slaughtering and processing can quickly multiply to numbers which are hazardous to human health when the product is temperature-abused. Effective pathogen detection and control is also essential during all phases of slaughter and further processing in order to deliver a uniformly safe product and protect the public health.

Nature of Change. Elimination of hazardous microbial contamination in food requires both rapid and quantitative methods of hazard identification and effective pre- and postharvest production and processing microbial control technologies. The specific components of the program include:

- o Production Systems to Control Pathogens (\$5,000,000). Effective pathogen control must be based on: (a) knowledge of the epidemiology of the organism, and (b) a thorough knowledge of the pathogenesis of the disease. The research will particularly stress identification of sources of infection and a delineation of the pathogenesis of bacterial infections in animals which are of particular food safety concern (e.g., *E. coli* 0157:H7, *Salmonella* and *Campylobacter*, and tuberculosis); development of a basic understanding of cellular-based immunomodulation in order to enhance disease resistance and decrease carriers of pathogens; and development of vaccines, competitive bacterial flora or other specific disease control measures. This research is consistent with

the priorities and programs of the Food Safety and Inspection Service and the Animal and Plant Health Inspection Service.

- o E. coli, Salmonella and Other Food Pathogen Control during Slaughtering and Processing (\$5,000,000). ARS will develop more rapid and user-friendly methodology to enhance identification of hazardous bacteria and detect improper preparation and handling of both meat and poultry carcasses and food products. Improved methods for slaughtering and processing, including alternatives to the use of chlorine, will be developed to minimize the sources of contamination. Models for bacterial growth will be expanded to include new pathogens, fluctuating temperatures, microbial interaction and competition, and product composition. Irradiation studies with beef, pork and poultry will be conducted to include several different E. coli O157:H7 strains, and the effects of various product handling procedures and temperatures. These research thrusts are consistent with the priorities and programs of the Food Safety and Inspection Service.

Within the increase requested, ARS will establish an 1890's Center of Excellence in cooperation with the University of Maryland - Eastern Shore. APHIS and FSIS also will participate in the Center. Funding for this initiative is \$250,000.

- (g) An increase of \$5,000,000 for research on Alternatives to Methyl Bromide.

Need for Change. Methyl bromide is a halogenated hydrocarbon, broad spectrum biocide which is widely used as a structural, postharvest commodity and soil fumigant to control insects, weeds, and plant pathogens (including nematodes). Methyl bromide has been classified as an ozone depleter. Pursuant to the provisions of the Clean Air Act, EPA will regulate production and use of methyl bromide with a complete phaseout of production (and importation) by the year 2000.

Loss of methyl bromide as a soil fumigant for agricultural uses will adversely affect U.S. crop production. Alternative technologies and strategies to control soilborne pests (i.e., plant pathogens, including nematodes, insects, and weeds) are less effective and more costly than methyl bromide. Without methyl bromide, alternative soilborne disease and pest management strategies will be needed to make continued cultivation of high value crops (e.g., strawberries, tomatoes, nursery crops) economically feasible in the U.S.

Presently, methyl bromide is the only satisfactory postharvest fumigant of fresh commodities for insect pests. Its loss will have a severe impact on the shelf life of U.S. agricultural commodities sold domestically. Also, many U.S. agricultural commodities for export must be fumigated with methyl bromide on an absolute or "as needed" basis depending on the country and commodity to satisfy quarantine regulations. In addition, many fresh fruits and vegetables currently must be fumigated with methyl bromide as a condition of entry into the U.S. to prevent inadvertent introduction of foreign plant pests. These importations will be curtailed or stopped unless substitutes for methyl bromide can be found. Restriction or reduction of imported produce, particularly winter vegetables, would reduce the availability of fresh produce in the marketplace and change the food consumption patterns of the American public.

Nature of Change. Research will be initiated or expanded to develop effective, economically feasible alternatives to methyl bromide fumigation for domestic and quarantine purposes. Pest management strategies will be developed based on host resistance; microbial biological control; cultural practices; pest behavior modification and mating disruption; improved chemical control (including new or alternate chemicals, natural products, improved formulation technology, and improved application technology); and integrated pest management. These strategies will be compatible with existing production systems.

A wide range of management and technological options will be developed and evaluated to reduce farm costs, protect worker and consumer health, ensure environmental quality, and enhance beneficial biological interactions and natural processes.

Emphasis will also be placed on systems and combination approaches. Approaches will be developed which utilize and maximize the advantages of each component of the system (i.e., quickness of kill versus long-time protection) into integrated systems providing cost-effective protection with low environmental impact. It is critical that these systems be developed for commodities which can currently only be exported under methyl bromide mandatory protocols. Commodities to be addressed by this research include cherries, walnuts, apples, various berries, peaches, nectarines, citrus, grapes, and various vegetable crops.

Soil Fumigation Alternatives.

- o **Biological Control (\$700,000).** Antagonistic microorganisms and pathogens of major pre- and postharvest plant diseases will be isolated, identified, evaluated and developed for their pest management potential. Specific delivery technologies will be developed to ensure efficacy.
- o **Host Resistance (\$1,000,000).** Resistance will be developed in small fruit and vegetable crops to major pre- and postharvest pests, including insects, diseases, and nematodes. This will be achieved through conventional breeding and biotechnological approaches and induced resistance.
- o **Cultural Practices (\$500,000).** Crop production strategies will be developed that incorporate new and improved cultural practices to effectively and economically manage pests of strawberries, a major fruit crop that is very dependent on methyl bromide treatments. These will include improved crop rotations; soil amendments to improve soil structure and enhance natural disease, insect, and weed suppression; improved tillage; soil solarization; new and improved mulches; and soilless media.
- o **Chemical Control (\$300,000).** Improved chemical control technologies will be developed to manage pests of vegetable crops to ensure worker safety, consumer health, and environmental quality. Natural pesticide products will be identified, evaluated and developed. Improved pesticide formulation and delivery technologies will be developed.

Quarantine Alternatives.

- o **Combination Treatments, Pest Free and Systems Approaches (\$1,900,000).** Systems approaches and combination treatments for insect quarantine disinfestation will be developed for the export of commodities currently requiring methyl bromide fumigation. For many

U.S. export commodities, no known single treatment provides quarantine security. Techniques to develop pest free zones will be developed where possible to allow shipment of commodities without any commodity treatment, particularly where treatments degrade commodity quality.

- o **Physical Control Treatments Including Temperature and Ionizing/Nonionizing Radiation (\$600,000).** Work will be intensified to develop quarantine treatments based on the application of ionizing and nonionizing radiation. Research on heat shock and conditioning of a commodity before treatment will be instituted to increase the effectiveness of the treatment and provide for maintenance of commodity quality.

(h) A redirection of \$3,899,000 for research on higher priority projects.

Need for Change. ARS' research priorities are continually examined to ensure that they meet the needs of producers and consumers. Areas of increased importance which require additional resources through redirection are: food safety, methyl bromide alternatives, and pesticide reduction.

Nature of Change. The redirection of resources between major activities is as follows:

From Plant Sciences:

To Commodity Conversion and Delivery:

Transgenic introduction of novel compounds for insect control, Albany, CA (-\$577,000)	Biochemical basis for resistance to aflatoxin production in tree nuts, Albany, CA (+\$577,000)
Genes associated with flower development, Athens, GA (-\$195,000)	Pathogen reduction in poultry, Athens, GA (+\$195,000)
Pecan research, Athens, GA (-\$242,000)	Fusarium mycotoxin formation/metabolites, Athens, GA (+\$242,000)
Production of peptides, Peoria, IL (-\$415,000)	Biochemical basis for mycotoxin resistance in corn, Peoria, IL (+\$415,000)
Production of value-added seeds, Peoria, IL (-\$274,000)	Biochemical basis for mycotoxin resistance in corn, Peoria, IL (+\$274,000)
Biochemical bases-insect behavior, Albany, CA (-\$404,000)	Methodology to detect and control chemical residues, Albany, CA (+\$404,000)
Improved nutrition quality of legume seed protein Ithaca, NY (-\$316,000)	Control of translocation of toxic mineral levels in crops, Ithaca, NY (+\$316,000)
Limitations to sucrose accumulation in sugarcane, Weslaco, TX (-\$325,000)	Alternative postharvest quarantine treatments for fruit/vegetables, Weslaco, TX (+\$325,000)
Detection and control strategies of citrus diseases, Orlando, FL (-\$250,000)	Alternative postharvest technologies to meet export requirements, Orlando, FL (+\$250,000)

Citrus/avocado nutrition Pasadena, CA (-\$287,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA CA (+\$287,000)
Bioregulation of plant responses, Pasadena, CA (-\$159,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA (+\$159,000)
Experimental bioassay growth systems Pasadena, CA (-\$65,000)	Alternative quarantine treatments for tree nuts, dried/fresh fruits, Fresno, CA (+\$65,000)

From Animal Sciences:To Commodity Conversion and Delivery:

Rangeland weeds, Albany, CA (-\$390,000)	Methods for toxic residue detection, Albany, CA (+\$390,000)
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(5) A net increase of \$3,763,000 for research on Human Nutrition consisting of:

- (a) An increase of \$188,000 for anticipated pay costs.
- (b) An increase of \$322,000 which reflects a 2.6% increase in non-salary costs.
- (c) An increase of \$74,000 for anticipated SES lump-sum costs.
- (d) A decrease of \$321,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$321,000.

Nature of Change. In order to achieve these savings, ARS will reduce discretionary expenses by \$321,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) An increase of \$3,500,000 for research on Food Composition to Support Labeling Requirements.

Need for Change. The requirements for nutrient labeling of food demand that appropriate methods be available and standardized for regulatory and commercial use. Such standardization requires the availability of standard reference materials, both for pure nutrients and for food matrices. More accurate, cost effective and environmentally acceptable analytical methods than are now generally available for many nutrients must be devised. Rapid, accurate methods for analysis of food components, newly recognized as important for health and disease prevention (e.g., carotenoids, bioflavonoids, etc.), will also be required as nutritional value is established. More rapid transfer of new and improved methods are also needed to assure accurate labeling and reduction of enforcement problems. With suitable databases for food composition, the food industry can reduce labeling costs while assuring regulatory compliance.

Nature of Change. Measurement systems for nutrients and food components (e.g., folic acid vitamers, soluble and insoluble dietary fiber, vitamin E isomers, flavonoids, phyto-estrogens, saponins, and mineral species, such as selenium and chromium) will be developed.

Standard reference materials for food matrices will be developed for distribution by the National Institute of Standards and Technology. Priorities will be to standardize methods for nutrients required on the label as stated in the Nutrition Labeling and Education Act Regulations. In addition, folate research will be addressed to provide a scientific basis for decisions regarding the need for fortification of food.

As food components are identified in relation to protection from disease risk, priorities for their analysis will be determined. New data on food composition will be made available for appropriate databases as they are developed.

(6) A net decrease of \$386,000 for research on Integration of Agricultural Systems consisting of:

- (a) An increase of \$183,000 for anticipated pay costs.
- (b) An increase of \$312,000 which reflects a 2.6% increase in non-salary costs.
- (c) An increase of \$59,000 for anticipated SES lump-sum costs.
- (d) A decrease of \$312,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$312,000.

Nature of Change. In order to achieve these savings, ARS will reduce discretionary expenses by \$312,000 in FY 1995 in areas such as travel, printing, communications, supplies and materials, contracting, consultants, and extramural activities.

- (e) A decrease of \$628,000 which reflects savings from the closeout of research laboratories and reduction in lower priority research projects.

Need for Change. Streamlining the USDA research activities will result in savings which will be directed to achieve critical research initiatives. The budget recommendations include the elimination of selected research locations and the termination and reduction of specific lines of ongoing research. More effective utilization of remaining laboratories will result in lower overhead costs. Specific locations and research projects were selected to provide additional resources necessary to carry out more critical research impacting food safety, methyl bromide alternatives and pesticide reduction.

Nature of Change. Research at the following locations is proposed for termination:

El Reno, Oklahoma (\$565,700)

The mission of the Grazinglands Research Facility at El Reno is to increase the efficient production of lean red meat from forages by increasing the quantity and quality of forages. A soil/forage/ animal systems research approach to meat production is the main research emphasis at El Reno. In addition, facilities are old and badly in need of upgrading/modernization, especially the feedlots, fences, other infrastructure, etc. Similar research is being conducted by ARS at Clay Center, Nebraska and Miles City, Montana. The research programs at these locations are better focused, more productive and can meet the research

needs of clients located in different ecological production areas of the the United States.

Headquarters and Area Management Reduction (\$62,300)

In addition to terminations in direct research projects proposed herein, the Agency is proposing savings through a reduction in administrative and program management support. Reductions will be taken at the Washington, D.C. Headquarters and Area management offices.

United States Department of Agriculture
Agricultural Research Service

CONTINGENCY RESEARCH FUND--FY 1993

The Contingency Research Fund, established by Congress in Fiscal Year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency funding exists, such as an unexpected scientific "breakthrough," or outbreaks of diseases or pest problems where it appears inadvisable to wait for consideration of additional funding through the regular budget process. In allocating these funds, the agency policy is to make no commitment beyond the current fiscal year.

1993 Releases

Provide research resources to combat sweet potato whitefly.	\$506,000
College Station, Texas	60,000
Weslaco, Texas	100,000
Albany, California	50,000
Phoenix, Arizona	135,000
Athens, Georgia	15,000
Tifton, Georgia	45,000
Beltsville, Maryland	46,000
Orlando, Florida	55,000
Purchase equipment (computers, statistical software, temperature recorder, thermometer, chronometer, film recorder, dew point monitor), Fresno, California ..	27,500
Replace corn crop for animal feed lost during the Midwest floods, Clay Center, Nebraska	100,000
Repair air conditioning system damaged during electrical storm; and purchase cold box and computers, Weslaco, Texas	116,662
Replace/repair windows, skylight, vehicle tail lights, anemometer cups, roofs, aluminum wind tunnel and field erosion samplers damaged in hail storm, Lubbock, Texas	9,700
Replace/repair roof panels, holes, and stress cracks in greenhouse damaged in hail storm, Stillwater, Oklahoma	14,400
Replace/repair roof shingles, rain gutters, window screens, vent caps and pickup truck damaged in hail storm, Woodward, Oklahoma	6,000
Replace portable greenhouses destroyed by high winds, Tifton, Georgia	9,540
Replace environmental tunnel greenhouse destroyed by tornado, Gainesville, Florida	8,000
Replace diesel-powered backup generator struck by lightning, Brooksville, Florida	22,000
Replace air conditioning system struck by lightning, Canal Point, Florida	9,000
Repair greenhouse roofs damaged in hail storm, Raleigh, North Carolina	37,821
Assist APHIS in screwworm outbreak control:	
Lincoln, Nebraska	9,500
Tuxtla, Mexico	22,400
Total, Contingency Research Fund	<u>898,523</u>

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
ALABAMA, Auburn.....	\$2,654,466	36	\$2,777,600	36	\$2,777,600	36
ALASKA, Fairbanks.....	716,627	8	729,500	8	- -	- -
ARIZONA						
Phoenix.....	6,626,073	103	7,411,100	103	7,411,100	101
Tucson.....	3,250,477	48	3,200,900	42	3,200,900	42
Total.....	9,876,550	151	10,612,000	145	10,612,000	143
ARKANSAS						
Booneville.....	1,336,665	23	1,800,800	23	1,800,800	23
Fayetteville.....	924,943	12	1,071,000	11	1,071,000	11
Pine Bluff.....	- -	- -	112,500	3	112,500	3
Stuttgart.....	547,543	3	664,800	5	664,800	6
Total.....	2,809,151	38	3,649,100	42	3,649,100	43
CALIFORNIA						
Albany.....	21,471,930	234	21,182,200	229	22,477,200	254
Brawley.....	325,725	6	306,000	6	- -	- -
Davis.....	1,614,054	26	1,797,300	29	1,797,300	28
Fresno.....	4,432,860	66	4,437,500	64	6,231,400	64
Pasadena.....	1,491,780	20	1,520,400	18	- -	- -
Riverside.....	3,977,056	51	3,917,600	51	3,917,600	52
Salinas.....	2,133,807	37	1,982,900	36	2,368,200	36
San Francisco.....	4,633,866	42	4,643,300	41	4,643,300	40
Shafter.....	954,681	10	1,057,000	12	1,057,000	12
Total.....	41,035,759	492	40,844,200	486	42,492,000	486
COLORADO						
Akron.....	1,418,424	17	1,245,900	23	1,245,900	23
Fort Collins.....	10,880,552	143	10,895,300	140	10,795,300	139
Total.....	12,298,976	160	12,141,200	163	12,041,200	162
DELAWARE						
Georgetown.....	769,735	10	756,200	12	- -	- -
Newark.....	635,922	10	619,600	11	619,600	11
Total.....	1,405,657	20	1,375,800	23	619,600	11
DISTRICT OF COLUMBIA						
Program.....	4,292,825	67	6,505,600	92	6,546,900	96
Headquarters						
Federal Admin.....	34,523,105	557	37,395,800	576	36,323,200	555
Central Services.....	8,072,577	- -	8,068,300	- -	8,068,300	- -
Subtotal.....	42,595,682	557	45,464,100	576	44,391,500	555
Total.....	46,888,507	624	51,969,700	668	50,938,400	651
FLORIDA						
Brooksville.....	766,078	11	735,900	10	735,900	10
Canal Point.....	999,735	21	951,100	22	951,100	22
Fort Lauderdale.....	706,957	11	858,400	18	858,400	17
Gainesville.....	9,888,555	149	9,764,400	146	11,084,400	158
Miami.....	1,751,647	34	1,752,100	33	- -	- -
Orlando.....	4,804,356	69	4,694,000	64	5,468,800	80
Winter Haven.....	1,274,254	18	1,279,500	18	1,279,500	18
Total.....	20,191,582	313	20,035,400	311	20,378,100	305

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
GEORGIA						
Athens.....	14,331,147	193	15,957,200	195	16,757,200	209
Byron.....	2,196,891	43	2,167,600	39	2,167,600	39
Dawson.....	2,230,623	33	2,089,200	29	2,089,200	31
Experiment.....	1,814,272	23	1,669,600	21	1,669,600	21
Savannah.....	2,778,425	45	2,820,000	39	- -	- -
Tifton.....	8,567,359	114	8,175,100	108	8,625,100	108
Watkinsville.....	2,059,955	21	2,045,100	22	2,045,100	23
Total.....	33,978,672	472	34,923,800	453	33,353,800	431
HAWAII, Hilo.....	8,532,164	93	9,101,300	105	7,623,500	100
IDAHO						
Aberdeen.....	1,878,934	18	1,942,500	19	1,942,500	19
Boise.....	1,717,774	19	1,811,400	21	1,811,400	21
Dubois.....	2,128,440	18	2,090,100	19	2,090,100	19
Kimberly.....	2,491,846	41	2,583,500	40	2,583,500	40
Total.....	8,216,994	96	8,427,500	99	8,427,500	99
ILLINOIS						
Peoria.....	24,800,665	292	26,863,200	293	26,763,200	293
Urbana.....	4,021,803	46	3,661,200	43	3,661,200	43
Total.....	28,822,468	338	30,524,400	336	30,424,400	336
INDIANA, Lafayette.....	4,477,596	37	4,477,400	38	4,477,400	39
IOWA, Ames/Ankeny.....	26,189,883	347	25,687,300	344	27,937,300	344
KANSAS, Manhattan.....	4,947,683	68	5,191,500	66	6,981,100	84
KENTUCKY, Lexington....	1,546,942	15	1,548,500	16	- -	- -
LOUISIANA						
Baton Rouge.....	2,039,735	29	1,965,700	27	1,965,700	27
Houma.....	1,365,884	32	1,382,900	33	- -	- -
New Orleans.....	17,771,545	204	17,934,000	201	17,934,000	200
Total.....	21,177,164	265	21,282,600	261	19,899,700	227
MAINE, Orono.....	884,532	11	866,900	13	866,900	14
MARYLAND						
Beltsville.....	90,597,378	1,275	85,800,200	1,211	89,548,200	1,207
Frederick.....	2,298,379	31	2,120,300	29	2,120,300	29
Hyattsville.....	895,281	8	649,700	8	649,700	8
Princess Anne.....	- -	- -	- -	- -	225,000	3
Total.....	93,791,038	1,314	88,570,200	1,248	92,318,200	1,247
MASSACHUSETTS, Boston..	14,132,420	7	13,847,000	10	13,847,000	11
MICHIGAN, East Lansing.	4,076,113	57	3,901,600	54	3,901,600	54

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
MINNESOTA						
East Grand Forks.....	952,888	10	960,300	9	- -	- -
Morris.....	2,476,917	39	2,440,800	39	2,440,800	38
St. Paul.....	4,461,828	49	4,372,700	49	4,372,700	47
Total.....	7,891,633	98	7,773,800	97	6,813,500	85
MISSISSIPPI						
Mississippi State....	6,671,974	99	6,500,900	96	6,500,900	95
Oxford.....	5,254,053	62	5,174,400	61	5,624,400	61
Poplarville.....	840,482	13	809,000	14	809,000	13
Stoneville.....	14,299,694	200	14,152,600	196	14,052,600	196
Total.....	27,066,203	374	26,636,900	367	26,986,900	365
MISSOURI, Columbia.....	5,542,734	66	4,832,900	65	4,832,900	64
MONTANA						
Bozeman.....	1,707,138	30	1,652,600	24	1,652,600	23
Miles City.....	1,934,585	19	1,877,100	20	1,877,100	21
Sidney.....	756,318	11	741,600	14	- -	- -
Total.....	4,398,041	60	4,271,300	58	3,529,700	44
NEBRASKA						
Clay Center.....	12,387,440	138	12,611,200	140	14,186,200	151
Lincoln.....	4,281,229	45	4,263,900	40	4,263,900	38
Total.....	16,668,669	183	16,875,100	180	18,450,100	189
NEVADA, Reno.....	529,699	7	491,000	7	491,000	7
NEW JERSEY						
Chatsworth.....	508,735	4	514,400	4	- -	- -
NEW MEXICO						
Las Cruces.....	1,455,198	23	1,451,200	23	1,451,200	23
NEW YORK						
Geneva.....	1,089,639	8	1,201,000	7	1,201,000	7
Ithaca.....	3,898,958	39	3,701,800	43	3,701,800	43
Plum Island.....	9,240,790	47	9,034,300	46	9,034,300	46
Total.....	14,229,387	94	13,937,100	96	13,937,100	96
NORTH CAROLINA						
Oxford.....	1,803,689	29	1,766,800	29	- -	- -
Raleigh.....	5,663,037	65	5,547,300	64	5,547,300	67
Total.....	7,466,726	94	7,314,100	93	5,547,300	67
NORTH DAKOTA						
Fargo.....	9,450,245	123	9,488,700	120	9,488,700	120
Grand Forks.....	7,297,917	65	7,327,100	63	7,327,100	63
Mandan.....	2,890,573	46	2,817,500	45	2,817,500	45
Total.....	19,638,735	234	19,633,300	228	19,633,300	228

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
OHIO						
Columbus.....	849,933	9	764,200	10	764,200	10
Coshocton.....	1,009,574	18	1,014,100	18	1,014,100	18
Delaware.....	327,740	4	304,800	6	- -	- -
Wooster.....	2,326,732	40	2,350,700	35	2,350,700	35
Total.....	4,513,979	71	4,433,800	69	4,129,000	63
OKLAHOMA						
Durant.....	2,489,013	39	2,472,000	33	2,472,000	33
El Reno.....	1,618,619	23	1,666,900	22	- -	- -
Lane.....	1,707,178	27	1,727,300	26	1,727,300	26
Stillwater.....	2,412,634	35	2,382,600	33	2,382,600	36
Woodward.....	1,338,750	18	1,265,800	21	1,265,800	21
Total.....	9,566,194	142	9,514,600	135	7,847,700	116
OREGON						
Burns.....	493,935	3	494,200	4	494,200	4
Corvallis.....	4,597,862	70	5,214,300	70	5,484,300	72
Pendleton.....	1,458,664	20	1,445,300	20	1,445,300	20
Total.....	6,550,461	93	7,153,800	94	7,423,800	96
PENNSYLVANIA						
University Park.....	2,811,677	43	2,871,100	43	2,871,100	40
Wyndmoor.....	19,458,982	235	21,179,700	239	23,104,700	273
Total.....	22,270,659	278	24,050,800	282	25,975,800	313
SOUTH CAROLINA						
Charleston.....	2,592,574	42	2,593,600	37	3,043,600	40
Clemson.....	1,841,212	30	1,998,300	31	1,998,300	31
Florence.....	2,044,927	30	1,999,300	27	1,999,300	27
Total.....	6,478,713	102	6,591,200	95	7,041,200	98
SOUTH DAKOTA						
Brookings-Madison....	1,627,661	28	1,672,700	25	1,672,700	25
TENNESSEE						
Jackson.....	167,607	2	166,900	2	- -	- -
Lewisburg.....	143,815	2	143,900	1	- -	- -
McMinnville.....	- -	- -	450,000	2	450,000	6
Total.....	311,422	4	760,800	5	450,000	6
TEXAS						
Beaumont.....	1,018,316	16	958,100	16	958,100	16
Brownwood.....	586,215	13	581,100	13	- -	- -
Bushland.....	2,370,968	33	2,330,600	37	2,330,600	37
College Station.....	11,484,623	153	11,324,800	153	11,782,800	151
Houston.....	10,215,610	7	10,173,600	8	10,173,600	10
Kerrville.....	2,589,191	44	2,691,100	48	2,691,100	50
Lubbock.....	3,377,440	54	3,175,200	63	3,175,200	63
Temple.....	3,114,279	48	3,029,700	46	3,029,700	46
Weslaco.....	7,900,187	118	8,514,300	117	8,739,300	127
Total.....	42,656,829	486	42,778,500	501	42,880,400	500

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
UTAH, Logan.....	5,078,594	48	3,992,900	50	3,992,900	50
VIRGINIA						
Suffolk	782,298	9	666,700	9	- -	- -
WASHINGTON						
Prosser.....	2,678,576	37	2,257,600	36	2,257,600	36
Pullman.....	6,702,299	93	6,583,800	93	6,583,800	93
Wenatchee.....	1,386,340	22	1,461,200	22	1,461,200	22
Yakima.....	2,903,383	47	2,724,900	58	3,264,900	58
Total.....	13,670,598	199	13,027,500	209	13,567,500	209
WEST VIRGINIA						
Beckley.....	3,516,720	52	3,454,800	53	3,454,800	53
Kearneysville.....	6,221,527	61	4,749,000	65	4,749,000	65
Total.....	9,738,247	113	8,203,800	118	8,203,800	118
WISCONSIN, Madison....	5,608,967	66	5,371,400	65	5,371,400	64
WYOMING						
Cheyenne.....	1,663,467	27	1,621,500	26	1,621,500	26
Laramie.....	1,930,045	26	2,016,500	26	2,016,500	26
Total.....	3,593,512	53	3,638,000	52	3,638,000	52
PUERTO RICO						
Mayaguez.....	2,300,686	46	2,251,400	43	2,684,400	47
VIRGIN ISLANDS						
St. Croix.....	264,079	5	284,900	5	284,900	5
OTHER COUNTRIES						
Argentina,						
Buenos Aires.....	310,167	- -	281,000	- -	281,000	- -
France, Montpellier..	2,524,161	4	1,860,700	4	1,860,700	4
Korea, Seoul.....	206,739	1	- -	- -	- -	- -
Mexico, Tuxtla						
Gutierrez.....	1,034,173	5	915,600	5	915,600	5
Netherlands,						
Rotterdam.....	352,852	1	342,600	1	- -	- -
Total.....	4,428,092	11	3,399,900	10	3,057,300	9

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION
(On basis of adjusted appropriation)

Location	Actual 1993		Estimated 1994		Estimated 1995	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
Extramural and Funds Administered from Headquarters....	7,204,038	- -	31,240,700	- -	44,966,800	- -
Contingency Research Fund.....	<u>1/</u>	- -	928,500	- -	928,500	- -
Repair & Maintenance of Facilities.....	17,064,876	- -	17,362,500	- -	17,362,500	- -
Unobligated Balance....	2,564,832	- -	- -	- -	- -	- -
Subtotal, Available or Estimate.....	660,321,441	7,953	683,540,000	7,910	696,718,000	7,762
Allotment to Forest Service.....	345,559	- -	361,000	- -	361,000	- -
Transfer to Off. of Sec	212,000	- -	- -	- -	- -	- -
Pay Costs.....	- -	- -	- -	- -	4,139,000	- -
TOTAL, Appropriation...	660,879,000	7,953	683,901,000	7,910	701,218,000	7,762

NOTE:

1/ Obligations incurred in 1993 under the Contingency Research Fund in the amount of \$898,523 are reflected in the amount for recipient locations.

AGRICULTURAL RESEARCH SERVICE

STATUS OF PROGRAM

Current activities, progress, and programs under each project are outlined below:

RESEARCH IN SOIL, WATER, AND AIR SCIENCES

Current Activities: Management guidelines, practices, and systems are being developed to promote cost-effective conservation and enhancement of the quality and production capacity of our Nation's soil, water, and air resources for future generations. The research program stresses the development of resource management systems that farmers, extension specialists, and agri-industry can use to maintain and enhance farm profitability while minimizing or reversing adverse impacts on long-term productivity and the environment. The program includes research on technologies for assessing the effects of agricultural activities on the quality and productivity of the natural resource base and of changes in the quality of the resource base on the profitability and productivity of agriculture. Emphasis is given to the development of management practices that reduce soil erosion, improve chemical use efficiency, maintain an optimum physical and biological soil environment for plant growth, and conserve the quality and quantity of the Nation's surface water and ground water resources. Research is also conducted to ensure that soil and water conservation strategies are consistent with the productivity goals of agriculture and the long-term profitability of farming. Emphasis is being placed on water quality protection, sustainable agriculture, waste utilization, and a better understanding of the impact of global change on agricultural productivity and on soil and water conservation and protection.

Selected examples of recent progress:

Erosion was controlled by no-till and when postemergence herbicides were used they did not contaminate water supplies. Conservation tillage, including no-till, controls soil erosion but may harm water quality because no-till generally results in higher water infiltration rates, thus permitting more water and, possibly, more chemicals to leach below the plant root zone. Since 1990, scientists have measured herbicide levels in surface runoff and shallow ground water on two similar fields in northern Mississippi. While about 100 times less sediment was lost under no-till, only preemergence--not postemergence--herbicides were detected in the runoff and shallow ground water. So far, the data do not indicate any overall water quality problems when soybeans are grown under no-till with low inputs of chemicals.

Lupins show potential for harnessing the winter growing season to provide high protein grain and forage. Lack of a legume grain cash crop leaves many areas in the South unproductive and unprotected during the winter months. Working with new varieties of lupins, researchers in Alabama have produced up to 60 bushels of 36 percent protein grain during the winter growing season. Manufacturers have processed the lupin grain into a nutritious, high protein pasta. If disease problems can be overcome and the commercial potential developed, lupins will provide a crop needed in rotations that protect land from erosion; reduce the need for nitrogen fertilizer; and break biocycles that lead to buildup of diseases, insects and weeds, thereby reducing the need for farm chemicals.

Byproducts of cleaning air can improve productivity and water use on soils. Removal of sulfur oxides from the gaseous emissions of power plants is accomplished effectively by the use of calcium oxide. This process precipitates gypsum along with smaller amounts of other oxides and sulfates at rates of about 60 million tons per year. Studies in Indiana, Georgia, Colorado, and West Virginia show that these gypsiferous materials have the potential to substantially decrease runoff, increase infiltration, and increase productivity of our acid soils. When these potentials are fully developed, these waste

products (which now require costly disposal) should become a resource that will improve water use efficiency and productivity of acid and sodic soils.

Illite Clay holds large amounts of nitrogen and can release significant amounts to growing crops. Analyses of some soils for nitrogen available to crops often do not accurately predict crop response to added fertilizer. This can lead to uncertain fertilizer recommendations, leaching loss of nitrogen, and decreased yields. Amounts of ammonium nitrogen held between the platelets of illitic clays were determined on soils from several States where anomalous crop response to nitrogen had been reported. Up to 7,000 pounds of nitrogen per acre is held in this manner within the root zone in some soils. While the percentage of this nitrogen leaving the clay and being picked up by plant roots is small during a growing season, the total amount is often a significant part of the crops' needs. Understanding the huge capacity of these illitic soils to absorb and release nitrogen, and the rates of release involved, will enable more accurate fertilizer recommendations, thereby increasing crop yields and water quality.

Native grass seeds can be induced to germinate more rapidly in the spring to better compete with introduced weeds. Invasion of non-native weeds is a major source of resource degradation on millions of rangeland acres in the western United States. These weeds germinate rapidly in the fall and spring and become established more quickly than native species after site disturbance by wildfire. At Boise, Idaho, ARS scientists have developed techniques for treating native grass seeds so that they germinate faster at cold temperatures. Early germination and establishment allow the native species to take better advantage of soil moisture and get a head start in their competition with weeds. The Bureau of Land Management will be testing this technology for use in its 'greenstripping' program and in post-burn rangeland restoration efforts. Bulk seed treatments may also make it more economical for commercial seed companies to produce native grass seeds for burn-rehabilitation and restoration of public rangelands.

Improved design procedure will enhance the safety of earth emergency spillways. As part of its overall strategy to reduce the damages to property from large stream flows, the Soil Conservation Service (SCS) has assisted in the construction of more than 25,000 flood control structures. Most of these structures use earth emergency spillways to protect the dam from overtopping during major flood events. Concern about the risk of serious structural damage leading to breaching of these spillways has increased because of downstream development since construction has greatly increased the potential for major economic and environmental damage. A team of ARS and SCS professionals has developed an improved procedure for predicting the potential for failure of these earth spillways. This procedure is based on the research findings of ARS and the field data and expertise of SCS. The procedure is being incorporated into software for use in designing new spillways and, where appropriate, modifying existing spillways. (Several other agencies and organizations will undoubtedly benefit from this development.)

Crop residues and earthworm activity in no-till farming control erosion. Row crop production on steep, erodible fields has often resulted in major land and water degradation. No-till farming systems offer an economically viable solution to the sustainable farming of these lands. Long-term watershed research in the steep Appalachian region of eastern Ohio has shown that the increased organic matter in the surface soil resulting from no-till farming increases earthworm activity, reduces runoff and erosion, and increases crop yields. Many of the critical resource conservation and environmental aspects of no-till farming were identified and evaluated on these steep Appalachian watersheds, enabling this conservation farming system to gain wide acceptance in the farm community. Primarily because of the soil conservation benefits of no-till farming, about 32 million acres of the Nation's croplands are now in no-till farming, and the Conservation Technology Information Center in West Lafayette, Indiana, predicts an increase to 45 million acres by 1995.

In-vitro grown symbiotic fungi can be utilized as biofertilizer. Inoculation of fields with symbiotic fungi, "Biofertilizer," can relieve our dependency on costly synthetic fertilizers and pesticides and remove the threat of soil erosion and ground water pollution. Scientists at Wyndmoor, Pennsylvania, have discovered specific growth factors that allow the production of symbiotic fungi, which previously could not be grown in the absence of living plant roots. These studies demonstrate that the growth of the fungal cells under these laboratory conditions is not abnormal; i.e., nuclear cell division is the same as if the fungus were in intimate contact with the plant root. Symbiotic fungi produced in this manner could ultimately be scaled-up to commercial production and exploited for preinoculation of crop lands to support a program of low input sustainable agriculture.

Constructed wetland treats dairy farm wastewater. The Soil Conservation Service (SCS) personnel and technical consultants who are designing animal waste management facilities have only limited information on water quality benefits. SCS and ARS constructed a lagoon and three individual wetland cells on a dairy farm in Mississippi in 1990. A secondary or fourth cell was added in 1991 to increase the loading capability of the wetland system. ARS researchers evaluated the cell processing efficiency of 18 contaminants derived from milking equipment and tank cleanings, milking barn washings, loading area runoff, and rainfall. The greatest reductions were measured for coliform bacteria; ammonia; chlorophyll; and--to a lesser degree--carbonaceous biochemical and chemical oxygen demand; suspended solids; and total and filterable orthophosphorus. As the constructed wetland matures, a very successful point source management system is being demonstrated.

Pelleted paper and tire wastes show promise for wind erosion control. Waste paper and used tires are major components of the U.S. waste stream, filling landfills and otherwise posing environmental hazards. Soil erosion control is enhanced on many agricultural lands by maintaining mulch on the surface and increasing infiltration rates, but some crops do not leave enough mulch on the surface to give the needed protection. Scientists in Alabama and Texas are studying methods of using these wastes and their effects on soils and crops. Wind tunnel tests show that covering 10, 20, and 30 percent of soil surfaces with either of these wastes reduces soil erosion from wind by 70, 80, and 90 percent, respectively. If waste utilization techniques can be perfected and made economical, two important national problems--municipal waste disposal and erosion control--will be reduced.

Limestone sinkholes can funnel livestock waste and other pollutants into cave streams. Sinkholes are characteristic of limestone bedrock areas over karst formations found in the Midwest, Appalachia, and in Florida. These sinkholes feed surface springs and wells used for drinking water. As part of the USDA Water Quality Initiative, scientists have been sampling West Virginia's cave springs and streams, as well as a surface stream, weekly for the past 3 years. One cave stream system had a high nitrate level of 82 parts per million and an excessive fecal coliform bacteria count of over 23,000 colonies per 100 milliliters. ARS is cooperating with the Soil Conservation Service and Extension Service to investigate improved nutrient and livestock waste practices to reduce the water contamination.

RESEARCH IN PLANT SCIENCES

Current Activities: The research places emphasis on improving the efficiency of crop production and the quality of that production. By developing improved crop varieties, reducing costs and inputs associated with production, and improving quality (and value) to meet processor and consumer needs, plant science research will help to maintain and improve the competitiveness of our agricultural products in domestic and world markets. Research is conducted on a broad range of crops including grains, oilseeds, sugar crops, fruits, vegetables, ornamentals, forage, range, and industrial crops. The National Plant Germplasm System provides the foundation for genetic improvement and encompasses the acquisition, preservation, evaluation, and enhancement activities necessary to

properly utilize plant germplasm. New technologies offer powerful tools that can be utilized in genetic mapping and gene transfer. A broad range of technologies is being utilized to protect plants from disease, insect, nematode, weed, and climatic stresses. These include quarantine, biocontrol, host-plant resistance, management systems, and chemicals. Special emphasis is placed upon integrated approaches that are effective, efficient, and protective of soil, air, and water resources.

Selected examples of recent progress:

Genetic markers found in eastern gamagrass could significantly impact the development of superior corn varieties and improved forage grasses. The transfer of important genetic traits between corn and eastern gamagrass (a perennial grass distantly related to corn) has been hindered by limited genetic information and how best to utilize and manipulate genes from one to the other. Recently, molecular markers to identify (by DNA fingerprinting) the location of important agronomic, stress, and disease resistance traits have been developed from both species. This interregional cooperative research project at USDA units in Woodward, Oklahoma, and Columbia, Missouri, in cooperation with the University of Missouri-Columbia, combines the unique germplasm and expertise in plant breeding, cytology, and molecular biology that exists at these two facilities. The continuation of research on eastern gamagrass is intimately and mutually beneficial for the agronomic improvement of both corn and eastern gamagrass as food, grain, and forage crops in the United States and worldwide.

Amber spurge fleabeetles control leafy spurge. Leafy spurge, a noxious weed, suppresses native vegetation and reduces biodiversity over an estimated 5 million acres in at least 23 States. Economic losses exceed \$100 million annually on 1 million acres in North Dakota alone. The amber spurge fleabeetle, a biocontrol agent, was tested by ARS scientists at Montpelier, France, and introduced in 1987 into a leafy spurge experimental site near Bozeman, Montana, by personnel at that location. Adult fleabeetles destroy leaves and flowers on above-ground stems while larvae feed on the roots, reducing the plant's uptake of water and nutrients. By 1992, amber spurge fleabeetles had reduced the canopy cover of leafy spurge from its 1987 level of 57 percent to less than 1 percent while restoring native vegetation and biodiversity. In 1992 and 1993, more than 200,000 beetles were transferred from the Bozeman site to action agencies and public land managers to provide for 400 field insectaries for future redistribution to public lands and private individuals.

High levels of natural resistance to corn earworm have been found. The corn earworm is a highly destructive pest on corn crops. To reduce the use of persistent pesticides, ARS scientists at Athens, Georgia, have identified compounds in corn silks that prevent earworm damage in resistant corn varieties. Additionally, corn varieties have been found that make large amounts of these compounds. These newly discovered sources of resistance can now be used in breeding programs to produce varieties with genetic resistance to the corn earworm so that application of pesticides can be reduced or eliminated.

Coating for encapsulating pesticides and more. ARS scientists have developed a material made of cornstarch and lipid that coats and encapsulates pesticides and similar materials. This coating has been successfully tested as a seed coating for corn, soybeans, and other seeds. It adheres well, is highly stable and nontoxic, and allows the applied pesticide to retain its effectiveness because it is protected from degradation. The new product means that much smaller amounts of pesticide can be used on seeds without loss of effectiveness. This product is also being tested as a carrier for pharmaceutical products. In addition to the direct benefits, this type of high-value product could greatly expand the demand for cornstarch and vegetable oils, all of which are important products of American agriculture. The total market is not known at this time. However, the new technology should increase the demand for corn into the hundreds of thousands of bushels in order to produce the starch needed for the encapsulation process.

Germplasm line releases benefit commercial plant breeders. Commercial plant breeders have a continuing need to use improved germplasm lines as parents in their breeding programs. ARS scientists collect diverse germplasm throughout the world, improve the germplasm so that it approaches commercial acceptability, and release improved germplasm lines from which commercial companies can introduce and sell new improved varieties. ARS annually releases about 270 new plant varieties and germplasm lines; many of these releases are made cooperatively with State universities and nearly all have improved resistance to insect, disease, and nematode pests.

Leaf surface chemicals have high biological and pesticidal activities. Aphids and sweetpotato whiteflies are highly destructive pests on many food and commodity crops. ARS scientists at Athens, Georgia, analyzed the biological activities of leaf surface chemicals from species of *Nicotiana*--plants that are related to tobacco--and found that many of the plants produce chemicals that are not only toxic to aphids and whiteflies but also to bacteria; other chemicals are potent regulators of plant growth. The compositions of several of these active chemicals were determined to be derivatives of common sugar. The biological activity found in these compounds shows considerable potential for development into antibiotics, plant growth regulators, and biosafe natural pesticides.

Nematodes are used to control citrus root weevils. Citrus root weevils are a serious pest in Florida; they weaken citrus trees by feeding on the roots, threatening some 125,000 acres of citrus. Past control methods have relied heavily on chemical pesticides. ARS scientists at Orlando, Florida, working with a private company, have developed a way to use weevil-attacking nematodes as biological control agents. An integrated weevil control program including nematodes reduces pesticide applications from four to one per year. The nematodes became commercially available to growers in 1990 and are now being used as part of a weevil management program on nearly 40,000 citrus acres. Reduced use of pesticides, particularly in Florida's shallow soils, will help keep pesticides from entering into wells and ground water.

Preservation of tropical and subtropical plants of importance to U.S. agriculture. Since 1902, the ARS Tropical Agriculture Research Station (TARS), Mayaguez, Puerto Rico, has introduced, evaluated, preserved, and distributed economically important tropical and subtropical plants. Its collections comprise over 400 species and 116 genera of fruits, oil palm, root crops, banana, plantain, cereals, forage crops, bamboo, ornamentals, medicinals, and other specialty crops. Research involves breeding or selecting plants with disease resistance and high yield for the tropics and developing improved systems for better, more economical crop production. TARS also operates the Germplasm Introduction Research Unit on St. Croix, U.S. Virgin Islands, where large numbers of foreign sorghum and corn accessions are increased and evaluated under quarantine conditions so they may be released to breeders.

Guayule provides nonallergenic latex rubber. Many people, perhaps 500,000 individuals in the U.S. alone, are allergic to latex rubber made from rubber trees. Allergic reactions range from simple dermatitis to life-threatening anaphylactic shock. ARS scientists at Albany, California, and Phoenix, Arizona, have found that latex rubber from guayule shrubs, unlike latex from rubber trees, is nonallergenic. For this reason, guayule is an excellent source of latex for use in medical products; the latex can be readily removed from guayule plants by treatment with water. ARS scientists are also developing a simple extraction process for use on farms or by small local processors. This research shows that guayule is a source of medical rubber products, solving a serious health problem for many patients, while providing the southwestern U.S. with a promising new industry.

New cost-effective trap for Mediterranean fruit flies developed. ARS scientists at Gainesville, Florida, have developed a new cost-effective plastic trap with a novel and innovative dry synthetic lure for use in monitoring and controlling the Mediterranean fruit fly. The new trap is much cheaper and easier to use than the standard trap now utilized to trap Medflies; more importantly, by varying the

dose of the synthetic lure and other characteristics, the trap can be fine-tuned to capture more unmated females. Unlike existing traps that catch large numbers of nontarget flies, the new plastic trap is highly specific and thus shows great promise for monitoring Medflies and for eradicating or suppressing small populations of introduced flies. This trapping system will reduce the need to apply large amounts of insecticides to eradicate Medfly populations.

Disease-resistant wheat reduces fungicide use. Strawbreaker foot rot is a serious disease of wheat in the Pacific Northwest, reducing yields by 25 to 50 percent. In 1988, two wheat varieties with high resistance to strawbreaker foot rot were developed and released by ARS scientists at Pullman, Washington, with the cooperation of State scientists from Washington, Oregon, and Idaho. The Madsen and Hyak varieties have now been widely accepted by growers and are grown on an estimated 500,000 acres. This has resulted in reduced pesticide use and an estimated annual savings of over \$7 million. Use of resistant varieties also allows early fall sowing, with greater vegetation cover and reduced soil erosion during the winter months.

Irrigation application technology reduces herbicide rates. Herbicide rates and recommendations have been established for a wide range of soil and environmental conditions utilizing hydraulic boom sprayer application. ARS scientists at Tifton, Georgia, have shown that rates of herbicides, insecticides, and fertilizers can be reduced by as much as 50 percent by utilizing irrigation application technology that maintains efficacy equal to conventional application technology. Irrigation application technology creates environmental conditions and coverage that result in more efficient activity. Maintaining efficacy with reduced application rates also reduces the potential for creating adverse environmental impact on crops, soil, and water. This technology also allows producers to reduce application costs while maintaining their present productive levels.

Resistance to cotton root-knot nematode is found. The root-knot nematode is a serious pest of cotton on light textured soils, and commercial varieties presently have no resistance. ARS scientists at Mississippi State University, have now developed germplasm lines that are highly resistant to the nematode. This was accomplished by combining two required resistance genes in the same plant. Since only two genes are required and germplasm lines containing these genes have been released to commercial breeders, it is expected that nematode resistant varieties will soon be commercially available.

A source of reduced saturated fat content in soybean oil has been found. The Food and Drug Administration recommends that vegetable oil used for cooking or in salads should contain no more than 7 percent saturated fatty acids. The amount of palmitic acid, the primary saturated fatty acid in soybean oil, is now about 11 percent. A cooperative ARS breeding program with North Carolina State and Purdue University scientists has produced a new soybean strain with only 4.5 percent palmitic acid. This trait, now being incorporated into commercial varieties by traditional breeding practices, will greatly enhance the nutritional quality of soybean oil.

Genetic markers identify immigrant populations of tobacco budworm and corn earworm. Unexpected and sudden immigrations of tobacco budworm and corn earworm into U.S. cropping systems make management of these pests very difficult. ARS scientists at Fargo, North Dakota, have completed genetic fingerprinting of selected tobacco budworm and corn earworm populations from the U.S. and Mexico and have identified population-specific genetic markers. These genetic markers will help pest control managers to identify origins of migrant insect pests and target reduction efforts at the source. This strategy will benefit growers of a wide variety of crops including cotton, corn, soybean, tomato, and tobacco.

Discovery of the gene that offers resistance to bacterial speck disease in tomato. Working cooperatively under the ARS plant genome research program, ARS and Cornell University scientists used molecular genetic mapping techniques to locate the gene(s) that confers resistance in tomato plants to bacterial speck

disease (*Pseudomonas syringae*). Gene transfer will reduce disease incidence in this economically important crop, thus helping producers to reduce production costs and achieve superior yields and improved tomato quality.

Use of herbicides for weed control is reduced. Common cocklebur is one of the most competitive weeds in soybean production, and farmers spend at least \$100 million annually on its control. ARS scientists at St. Paul, Minnesota, have developed common cocklebur management systems that combine information on cocklebur emergence patterns with timely applications of reduced rates of herbicides. The researchers were able to reduce the amount of the chemical herbicide bentazon, needed to control common cocklebur by up to 88 percent without reducing soybean yield. This approach to controlling common cocklebur will reduce the cost of producing soybeans as well as reduce the quantity of herbicide released into the environment.

Soybean seed protein content varies with its position on the plant. Soybean meal is an important source of protein in animal feed and in some human diets. For this reason, an important objective in soybean breeding programs is to increase seed protein. ARS research at West Lafayette, Indiana, has found that seed protein content varies widely within individual plants. Protein is lowest in seeds at the bottom of the plant and becomes progressively higher in seeds toward the top of the plant. Seeds at the plant top average 11 percent more protein than seeds at the bottom, with variation as large as 46 percent in one variety. These new data show that a better understanding of the cause of variation in protein could lead to a more uniform, high level of protein in seeds throughout the soybean plant.

A simple treatment improves quality of leafy vegetables. Leafy vegetables sometimes have a bitter taste, especially with increasing age at harvest time. Studies by ARS scientists at Salinas, California, have provided a breakthrough in learning how to control bitterness and some other important quality factors. The quality of the produce, including increased beta-carotene content, is markedly improved by exposing the seedling plants to a short exposure of colored light before transplant. This treatment, which is still in the developmental stage, is expected to improve the quality and value of leafy vegetables, especially lettuce and spinach.

Efficient regeneration of transformed wheat plants. A major roadblock to the utilization of powerful new genetic engineering technologies has been the inability to efficiently regenerate transformed plants of major cereal grains, especially wheat. A dramatic advance has been made by Albany, California, scientists who developed a method to regenerate herbicide-selected fertile wheat plants. This technique results in the ability to identify transformed plants in as little as 75 days after bombardment. One or two transformed plants can usually be identified out of every 1,000 embryos bombarded. Other advantages of the technique are the ease of obtaining independent transformation events year-round and the use of standardized conditions and commercially available bombardment devices. A final advantage is that the technique is applicable to more than just the one variety used in the study.

The use of naturally occurring antagonistic organisms can reduce pesticide use. ARS scientists at Beltsville, Maryland, found that the amount of fungicide needed to control a disease of eggplant was reduced by 77 percent when the fungicide was combined with nondisease-causing fungi that interfered with the pathogenic fungi. Improved methods for maintaining the antagonist fungi were also reported. This method is being expanded to other crops to develop more environmentally acceptable control of plant diseases.

RESEARCH IN ANIMAL SCIENCES

Current Activities: The current research program places primary emphasis on improving the efficiency of livestock, poultry, and aquaculture production. Major thrusts include improving the productivity of animals; assuring the quality and safety of animal products used as food for humans; and reducing losses due

to diseases, parasites, and insect pests. To accomplish these goals, new technological innovations are needed to preserve and effectively utilize animal germplasm; understand how specific genes improve production, reproduction efficiency, and animal product quality; enhance genetic resistance to diseases, parasites, and insect pests; improve techniques to rapidly diagnose, prevent, manage, or eliminate diseases, parasites, and insect pests; and detect and control microbial and chemical residue contamination in live animals and animal products. The research is designed to solve both short- and long-term, high priority national problems and to address the needs of action and regulatory agencies. Research is under way on changing the genetic makeup of animals and influencing reproductive efficiency; improving nutritional and genetic redirection of undesirable lipids in animal products; improving the conversion of feed to animal products; developing genetically engineered vaccines for protection against diseases, parasites, and insect pests; developing new, rapid, and accurate methods of disease diagnosis; improving the safety of animal food products; and developing integrated management technologies for insect pests and disease vectors.

Selected examples of recent progress:

Successful preselection of sex in livestock and humans. Technology to preselect the sex of livestock could save the livestock industry millions of dollars annually. A scientist at Beltsville, Maryland, has successfully developed technology to preselect the sex of livestock offspring that is currently being transferred to the livestock industry worldwide. This technology is being applied to prevent X chromosome-linked disease transmission in humans by the Genetics and IVF Institute, Fairfax, Virginia.

Injection of cuts of meat with calcium chloride consistently produces tender meat. Inconsistency in meat tenderness is one of the major problems facing the meat industry. To enhance tenderness, meat is normally aged (storage at refrigerated conditions) for 1 to 4 weeks. During this period, a number of changes occur that result in tenderization. ARS scientists at Clay Center, Nebraska, have determined that variation in the rate and extent of aging is responsible for variation in meat tenderness at the consumer level. The problem was solved by injecting cuts of meat with a 2.2 percent solution of calcium chloride at 5 percent by weight. The process, called calcium-activated tenderization (CAT), is effective in all cuts of meat regardless of species or sex. ARS scientists are working closely with industry to facilitate commercial application of this technology.

A new vaccine protects against calf cryptosporidiosis. Cryptosporidium parvum is a major cause of diarrheal disease in calves. C. parvum in agricultural runoff can contaminate water supplies and cause human disease. The ARS scientists at Ames, Iowa, have developed a vaccine that reduces or eliminates Cryptosporidium diarrhea and oocyst shedding in experimentally infected calves. A field trial is under way to evaluate the vaccine, and a commercial company has been contacted to develop this product for market. This vaccine can reduce direct economic losses to the U.S. cattle industry as well as reduce the threat to the environment and public health.

Molecular genetic map of the chicken has been established. Similar to mile markers on a highway map, the molecular genetic map being developed at East Lansing, Michigan, will indicate where important genes contributing to a trait reside in the chicken genome. The ever-expanding genetic map currently contains 28 linkage groups and over 220 genetic markers. Resource populations are being developed for application of the genetic map to identify genes involved in production and disease resistance. Once the genes are identified, poultry breeders will be able to produce superior birds, and it would be possible for researchers to elucidate the mechanisms involved in production and disease resistance.

Cattle germplasm with high breeding value for twinning has been released for industry use. Small increases in the reproduction rate have a major impact on

efficiency of beef production. A population of cattle with an average twinning rate of 30 percent with individual animals with breeding values above 50 percent has been developed through intensive selection, based primarily on ovulation rate of puberal heifers. This research, which was accomplished by scientists at Clay Center, Nebraska, provides the basis for implementing a twinning technology by the beef cattle industry. A twinning technology has the potential to increase efficiency of beef production by 25 percent in animals that produce twins in intensive production systems. Through a cooperative agreement with a commercial artificial insemination organization, semen from high breeding value sires and embryos from high breeding value cows are being made available to the beef cattle industry.

Honey bee strain released to the beekeeping industry. Parasitic mites, particularly the Varroa mite and the tracheal mite, have caused extensive losses to beekeepers since they were discovered in the United States in the mid-1980's. A honey bee strain, imported from Yugoslavia, was released to the beekeeping industry following extensive field evaluation for resistance to parasitic mites by the ARS scientists at Baton Rouge, Louisiana. The Yugoslavian bees are at least twice as resistant to parasitic mites as susceptible domestic bees. It is estimated that this honey bee strain could save beekeepers \$2 per colony in tracheal mite treatments.

Genes directly injected into living tissues are functionally active. Heretofore, the introduction of new genes into animals has been achieved only by the laborious, inefficient procedure of producing transgenic animals. However, ARS scientists at Beltsville, Maryland, have developed a novel method of introducing foreign genes into tissues of animals. These findings could serve as the basis for development of new types of vaccines and unique gene therapy methods. Simply by injecting genes through the skin with a jet-injector, a device originally designed for vaccine inoculations, genes find their way into cells and become functionally active. This strategy was tested by injecting genes into muscles and mammary glands of mice and sheep. When tissue samples were collected 1 or 2 days later, low levels of proteins were detected that could only have been produced by the injected genes. Refinements of this approach may lead to significant improvements in the design of vaccines, provide a new means of targeting gene therapy to tumors, and offer an efficient approach to studying gene regulation.

Enhanced disease resistance in channel catfish reduces losses. Enteric septicemia of catfish is the most economically damaging infectious disease encountered in commercial catfish farming, causing losses estimated at millions of dollars annually. Research completed recently by Stoneville, Mississippi, in cooperation with Mississippi State University, indicates a potential to reduce channel catfish disease losses caused by E. septicemia. Catfish from three strains were exposed to E. septicemia bacteria and then monitored for survival. Results showed that fish from one of the strains had an average survival rate of 91 percent. Fish from the other two strains were considerably less resistant with an average survival rate of only 47 percent. This research shows the economic value from raising resistant strains of fish, as well as the potential for reducing disease losses through selective breeding.

Feeding strategies reduce methane from livestock. Methane has been implicated as a contributor to the buildup of greenhouse gases. Experiments conducted by ARS scientists at Beltsville, Maryland, showed that high-concentrate diets reduced methane produced by ruminal contents in vitro without reducing total fermentation. Increasing the amount of concentrate fed increased acidity which, in turn, reduced methane. Diets containing 50 percent or more forage responded with reduced methane from increased acidity, but were accompanied by reduced fermentation; such diets are not recommended. This research shows that high-concentrate diets minimize methane production and do not adversely affect animal performance, as long as ruminal pH is kept high enough to minimize acidosis problems.

A new diagnostic test for tuberculosis has been evaluated for use in cattle. Within the past 5 years, regulatory officials and livestock producers have noted a significant increase in the occurrence of tuberculosis in Texas cattle. The bovine tuberculin caudal fold skin test, used for decades to detect reactor cattle, requires expensive multiple handling and is difficult to use. Scientists at Ames, Iowa, have worked cooperatively with Federal and Texas regulatory officials to comparatively evaluate a new gamma interferon procedure for cell-mediated responses to tuberculosis. In an extensive field study, the two tests have been shown to provide nominally equivalent results for specificity and sensitivity. Further economic analysis and risk assessment of the new test may provide an economical and rapid complement or alternative to the currently used procedure for the control and eradication of tuberculosis in the United States.

Superior rams double lamb production. Use of rams with high mating capacity improves lamb production more than twofold while sustaining long-term genetic gains in the flock. Reproductive efficiency in domestic sheep is a problem not limited to females but also with a significant ram component that affects flock profitability. ARS scientists at Dubois, Idaho, classified rams by tests that screen for superior sexual behaviors. Selection for mating on the short-term produces a superior lamb crop, with more ewes giving birth in a shorter lambing season. Producers can use the technique to screen rams on the farm while benefiting through selection of superior rams for long-term, permanent genetic improvements.

Diagnostic kit for neosporosis in cattle. Neosporosis is a parasitic infection caused by a protozoan that was misdiagnosed as toxoplasmosis until 1988, when ARS scientists at Beltsville, Maryland, characterized Neospora caninum as a new species of pathogen. Collaborative studies with the University of California showed that Neospora was the most common cause of abortions in dairy cattle over a period of 6 years. Today, neosporosis abortions in cattle are recognized in at least 28 States. ARS scientists have developed a diagnostic kit, based on the indirect fluorescent antibody test, that is now commercially available to animal health professionals. The rapid and accurate diagnosis of neosporosis is extremely important to livestock producers, public health specialists, and veterinarians.

Swine chromosome 6 genomic library has been produced. ARS scientists at Beltsville, Maryland, have identified populations of pigs that exhibit superior carcass traits but that also have a genetic defect known as porcine stress syndrome. Pigs with this defect exhibit an increased likelihood of sudden death in response to stressors; however, they also exhibit superior lean meat content and decreased backfat depth when compared with other pigs. Genetic studies have mapped these traits to swine chromosome 6. In order to develop genetic markers that can define specific alleles of chromosome 6 genes that encode for the beneficial traits, chromosome 6 must be isolated. Laser-based flow cytometry has been used to display a clear pattern that separates chromosome 6 from a heterogeneous population. Laser-based sorting has recently been used to genetically map this chromosome. The goal is to provide microsatellite DNA that identifies genes associated with superior carcass traits of pigs.

Blood hormone is associated with increased litter size in swine. There is currently no reliable indicator that can be determined in the blood of male swine to predict litter size of their daughters. At Clay Center, Nebraska, recent studies with Chinese Meishan swine, a breed known for its large litters, determined that follicle-stimulating hormone concentrations were much greater in boars of this breed than in boars of conventional U.S. breeds. Additionally, in a population of crossbred swine that had undergone divergent selection for three generations, number of ovulations differed by two in the two selected groups. Blood concentrations of follicle-stimulating hormone were 29 percent greater in the females and males of the high ovulating group. Determination of follicle-stimulating hormone concentrations in boars would improve selection for leaner pork by minimizing any adverse effect on reproductive performance that can occur when boars are selected exclusively for meat quality.

Growth performance of shrimp fed different sources of dietary lipids. Lipids (fats) are indispensable macronutrients in shrimp diets, not only for their energy value, but also as sources of essential fatty acids, fat-soluble vitamins, sterols, and phospholipids. These compounds are vital to a wide range of life processes, and deficiencies could lead to poor growth, survival, and reproductive performance. In a 10-week feeding study, ARS scientists at Kanehoe, Hawaii, evaluated the nutritional value of seven dietary lipid sources and showed that both n-6 and n-3 fatty acids are dietary essentials for marine shrimp. However, lipids rich in n-3 fatty acids provided better growth, feed conversion, and survival than those rich in n-6 fatty acids. Menhaden fish oil, high in long-chain highly unsaturated fatty acids, promoted the best growth performance. This information is essential for the development of nutritionally balanced diets leading to better growth, reduced production costs, and increased income for shrimp farmers.

An inactivated vaccine for feeder calves and goats may provide protection against respiratory diseases associated with stress and shipment of livestock. Bovine respiratory diseases associated with shipment and other stresses of feeder calves cost the American beef cattle industry \$400 to \$800 million annually. An ultraviolet light-inactivated *Pasteurella haemolytica* vaccine has been developed and is being tested by ARS scientists at Bushland, Texas, to successfully control the most common bacterial cause of stress-related respiratory disease in feeder calves and goats. This vaccine may offer an inexpensive vaccine option to livestock shippers and to cattle feeders.

Modern-day broilers contain the genes needed to reduce fat deposition. The higher fat content of modern broilers suggests that genetic selection may have produced lines of broilers that lack the genes needed to produce a lean phenotype. ARS scientists at Georgetown, Delaware, produced indirect evidence that modern broilers do contain the genes necessary for a lean phenotype, but that suboptimal expression of these genes accounts for increased fat deposition. Experiments using an *in vitro* fat cell culture method showed that fat cells isolated from market-weight broilers can be induced to release more or less lipid by exposing them to selected hormones that cause changes in expression of fat cell proteins and that treatment of fat cells with glucagon decreased the expression of glucagon receptors. The glucagon receptor is a key cellular protein involved in fat deposition by broilers because it functions to inhibit lipid synthesis by liver cells and increases lipid release from fat cells. Studies are under way to develop a biotechnology-based approach to enhance expression of the glucagon receptor gene and thus enhance the ability of the bird's own glucagon to inhibit fat deposition in broilers.

Linoleic acid leads to new control for foulbrood disease of honey bees. American foulbrood and European foulbrood diseases cause losses to the beekeeping industry that exceed \$8 million each year. Both diseases, which are found in all 50 States, infest and kill honey bee larvae inside the hive. Laboratory research at Beltsville, Maryland, has shown that linoleic acid--found in oils from peanuts, corn, soybeans, cottonseed, sunflower, and other vegetables--inhibited the growth of the two bacteria that cause European and American foulbrood diseases. This natural remedy poses no harm to the bees and will not harm humans. This new natural control for foulbrood disease will help ensure an adequate supply of honey bees for pollination of important agricultural crops.

Trace minerals lower fat and cholesterol levels in broiler chickens. Genetic selection for rapid growth has, over time, produced broilers that consume feed in excess of their needs for lean tissue growth. This excess feed energy is deposited as fat, creating a health risk for consumers of chicken. Trace minerals alter the secretion and biological actions of hormones and thus offer a nonhormonal route for redirecting nutrients in broilers. In recent studies at Georgetown, Delaware, ARS scientists showed that inclusion of vanadium or silicon in the diet of growing broilers reduced fat content of chicken by 10 percent. In addition, supplemental chromium was found to decrease cholesterol levels by 10 percent. Although these results are preliminary, further work is under way to determine if a combination of these trace minerals will produce larger

reductions in fat and cholesterol levels. If successful, and pending approval by the Food and Drug Administration, poultry producers will be able to improve the nutritional content of chicken using a trace mineral "package" that is acceptable to consumers.

Genes have been identified to mount protection of anti-Trichinella spiralis. Because of food safety issues, prevention of *T. spiralis* infections in swine is of major importance to the pork industry. Once this parasite has encysted in the pig's muscle, few drugs are effective, yet at this stage of the parasite it is infectious to humans. Scientists at Beltsville, Maryland, have determined that certain pigs can react against their encysted *T. spiralis* muscle larvae, resulting in a muscle burden that is 50 to 90 percent reduced. A minimum of two genes are necessary for pigs to mount such an anti-encysted *T. spiralis* response. Further genome mapping studies are under way to determine exactly which genes encode these responses. Potentially, swine producers at risk for this parasite could use breeding stock that bear the appropriate alleles at the genes that encode this responsive state to improve food safety of pork.

Polymerase chain reaction in poultry breeding has been applied. A DNA amplification procedure was developed by ARS scientists at East Lansing, Michigan, to determine whether roosters have one or two copies of a gene that is a molecular marker for the commercially important late-feathering trait. This trait enables commercial hatchery personnel to identify the gender of chicks at hatch. In selecting potential grandparent sires, breeders would prefer propagating homozygous males with two copies of this gene rather than heterozygous males that have only one copy of this gene. This procedure identifies those males with two copies of the desired gene shortly after hatch, thus eliminating the cost incurred in raising undesirable males to sexual maturity.

RESEARCH IN COMMODITY CONVERSION AND DELIVERY

Current Activities: Increasing the competitiveness of U.S. commodities and products, while minimizing environmental impact and addressing safety needs of consumers, are paramount in determining postharvest research strategies. Developing new and expanded uses of agriculture commodities is also vital to the economy of U.S. farmers and rural communities, and to enhancing the competitive position of U.S. agriculture in world markets. New technological opportunities abound for achieving these market opportunities. Bioconversion, enzyme engineering, critical and supercritical processing, membrane separation and reaction, and extrusion all offer viable technological potential to meet the economic challenge of converting and producing agricultural commodities to new, safe, useful products.

To meet these challenges, ARS research expands knowledge of physical, biological, and chemical characteristics of food, feed, fiber, and industrial products. This research is important to the development and acceptance of new products, the elimination of trade barriers, and it is critical to commodity and product safety, quality, and value. Emphasis is placed on developing the technological basis for innovative industrial products that are benign to the environment and have sound commercial potential. Research is also being conducted to meet consumer demand for freshness and safety and to address regulatory agency needs for methods to detect product contamination.

Selected examples of recent progress:

Escherichia coli O157:H7 can be eliminated from meats by treatment with gamma radiation. Undercooked or raw meat has been linked to outbreaks of hemorrhagic diarrhea, kidney failure, and some deaths, particularly in children, due to the presence of *E. coli* O157:H7. ARS scientists at Wyndmoor, Pennsylvania, demonstrated that gamma irradiation of poultry meat or beef during processing can reduce the probability of this organism being present a thousandfold, using the currently approved minimum radiation dose for the treatment of poultry. Regulatory agencies and industry can use this information in the production of

meat free of this pathogen, thus benefitting the public by providing a safer food supply.

A genetic code for aflatoxin has been identified and targeted for elimination. Aflatoxin, a poison produced from the common molds Aspergillus flavus and A. parasiticus, causes severe losses in several major commodities including corn, peanut, cottonseed, and certain tree nuts. Scientists at New Orleans, Louisiana, have identified a "master switch" gene that triggers aflatoxin production in the particular mold that attacks the peanut. ARS scientists now have an efficient marker to search for new breeds of plants producing natural chemicals that specifically inhibit this master gene, thus eliminating aflatoxin contamination in the crops. In an alternative but related control approach, part of the genetic code responsible for aflatoxin was deleted to produce a harmless mold "cousin," which could be used to outcompete and eliminate aflatoxin-producing molds in crops.

Biodegradable cutlery. Totally biodegradable knives, forks, and spoons have been produced by injection molding of a starch-polyester composition. Under a CRADA with Zeneca Biological Products, which produces and markets a polyester (PHBV) made by a bacterium, ARS scientists have developed various starch-polyester compositions that can be made into cutlery and other I-time use plastic items now made from petroleum. The cutlery is being evaluated by the U.S. Army Natick Laboratory for use on marine vessels, which soon will not be allowed to dispose of nonbiodegradable items into the sea. Incorporation of starch lowers cost, modifies properties, and expands market opportunities for articles made from PHBV. Commercialization by the cooperator of the starch/PHBV compositions is expected soon. A broad range of totally biodegradable and compostable plastics is being sought to replace petroleum derived plastics that occupy up to 25 percent of the volume of landfills.

Breakthrough is achieved in wheat transformation technology. The improvement of bread wheats by the modern technology of genetic engineering has been limited by the inability to produce healthy, fertile transformed plants. This obstacle was overcome by scientists at Albany, California. A reliable method has been developed for the rapid production of fertile transformed wheat plants. The procedure involves the use of a "gene gun" to transfer the genes into embryos of wheat seeds and tissue culture techniques to produce new plants. The development of a method for producing genetically altered wheat plants represents a major advancement in the field of genetic engineering of cereal crops. The efficiency and reliability of this transformation procedure will enable researchers to modify important characteristics of wheat, such as bread baking quality and pathogen resistance, and to introduce genes for production of specialty chemicals and pharmaceuticals. Once developed, these improved lines can be incorporated into breeding programs throughout the country.

Molecules to mozzarella: a dietary prescription for all ages. To meet the challenge of reducing dietary fat intake for preadolescents, scientists at Wyndmoor, Pennsylvania, developed a low-fat Mozzarella cheese for use in USDA's National School Lunch Program. Many available low-fat Mozzarella cheeses were rubbery and did not melt. To prevent a similar outcome, a holistic research design was developed incorporating computer modeling, sophisticated evaluations of texture and meltability, and computer-enhanced electron microscopy. The resulting Mozzarella cheese--with a 59 percent reduction in fat content and excellent meltability--has undergone successful preliminary testing in several Philadelphia schools. This combination of basic and applied research has also yielded a new understanding of fat-protein interactions and forms an information base to guide future developments in other low-fat cheeses and dairy foods, thus providing nutritious products with enhanced consumer acceptability.

Biorational control of Indianmeal Moth. Control of insect pests of stored products has historically relied heavily on the use of conventional pesticides. Insecticide resistance and the mandated elimination of some pesticides have stimulated the investigation of mating disruption as a management strategy for the Indianmeal moth, a major cosmopolitan postharvest pest. Scientists at

Gainesville, Florida, have utilized existing technology to demonstrate that moth mating and reproduction in treated warehouses were reduced more than 90 percent relative to untreated control storages. These findings clearly demonstrate the potential for exploiting this biorational pest management tactic.

New fumigants for citrus against Caribbean fruit fly from natural plant chemicals may replace methyl bromide. Methyl bromide will no longer be available for use as a pesticide in a few years. Allyl alcohol, allyl acetate, and allyl propionate were top candidates from among 24 natural plant chemicals screened as potential substitutes. These fumigants have strong insecticidal properties against larvae at low dosages with no residual odor or taste, are rapidly biodegraded, and are safe for the ozone layer. Further tests will include toxicity to eggs and larvae in infested grapefruit, guavas, and carambolas, and efficacy as aqueous dips and fumigants. A candidate chemical that proves efficacious and safe may replace methyl bromide for quarantine disinfestation use and facilitate continuation of international trade in subtropical fruits and citrus.

A naturally occurring antimicrobial protein reduces bacteria in beef. The protein, nisin, was tested by ARS scientists for its ability to reduce pathogenic and spoilage bacteria in beef. Bacterial cells were first added to pieces of lean and fat beef tissues, followed by the application of nisin using a research carcass washer. Surviving bacteria were counted before and again after refrigeration for 24 hours. Nisin on either tissue killed 99.7-99.9 percent of the cells. Some bacteria survived during the 24 hours of refrigeration, but nisin still suppressed their growth. The use of nisin spray in meat processing plants could help assure both the safety and shelf life of beef.

Tests to monitor and verify end-point temperature of meat products during cooking are critical to both regulatory and industry quality control personnel. Scientists at Athens, Georgia, are working in cooperation with the Food Safety and Inspection Service and private companies to provide rapid, accurate and economical tests to indicate the minimum internal temperature of meat products reached during cooking. The tests can be used immediately after products are cooked or after frozen storage. Two enzymes that change significantly in the cooking range for meat (155 to 175 degrees) appear to be suitable as "markers" that can be used to develop tests for both groups: the tests can be used by regulatory personnel as screening procedures at import stations and during cooking and by industry personnel as a Hazard Analysis Critical Control Point procedure to ensure adequate cooking and to eliminate hazards of bacterial food poisoning.

Novel coatings increased shelf life and quality of fresh fruits and vegetables. Even with refrigeration, the shelf life of fresh produce is limited by shrinkage due to water loss and overripening. Scientists at Winter Haven, Florida, have devised two new coating technologies to address these problems. Nature-Seal, a recently patented edible coating, retards ripening of many fresh fruits and vegetables. This technology has been licensed to EcoScience of Worcester, Massachusetts, for use on papayas and limes. The other coating technology utilizes emulsions of natural waxes combined with currently used glossy coatings for citrus. These bi-layer coatings provide the necessary high gloss required by the industry, while greatly reducing the shrinkage that shortens shelf life and appearance.

Automatic surveillance of insects in grain storage facilities. Insect infestations in stored agricultural commodities result in annual losses of millions of dollars. Traditional practices for detecting and quantifying infestation are labor-intensive; involve visual inspections of grain samples; are insensitive to low insect densities; and do not provide continuous or thorough monitoring. Scientists at Gainesville, Florida, have developed a system to monitor for the presence of insects in grain storage bins using infrared technology. The detection activities of probes are continuously sent to a central computer, which indicates when and where infestations are developing.

By providing early detection of infestations, managers can initiate appropriate control measures as needed.

Bioluminescent Adenine Triphosphate measurements provide a rapid test for microbial contamination on carcass surfaces. The rapid detection of fecal contamination on carcasses is a major concern of the meat industry and regulatory agencies. Both groups are striving to implement rapid tests in overall food safety/quality programs such as Hazard Analysis of Critical Control Points (HACCP). ARS scientists have determined that measurement of microbial ATP provides a rapid indication of fecal contamination with greater levels of fecal contamination being associated with higher levels of microbial ATP. The assay responds similarly on lean or fat areas of the carcass. To date, the sensitivity is about 10,000 bacteria per square centimeter and the test takes less than 1 hour. Ongoing research will reduce the assay time and increase sensitivity. This rapid test should indicate if a carcass has been contaminated and if reconditioning methods were effective.

Starch-natural gum fat substitute. Scientists at Peoria, Illinois, have discovered a new product based on starch that could find widespread use in the food industry. Consisting of 95 percent starch and 5 percent of a natural gum such as guar or xanthan, these materials function as thickening agents and as fat substitutes in foods. Products are prepared by suspending a mixture of starch and gum in water, passing the mixture through a continuous steam jet cooker (to dissolve and to partially degrade the starch and gum), and finally drum-drying the resulting solution. Unique products have been prepared by varying the type of starch and gum used in the formulation. A U.S. patent on this technology has been filed, and patent protection in foreign countries is being sought. Pilot plant production and large-scale testing of these products of this type are currently being carried out under a Cooperative Research and Development Agreement (CRADA) with a company specializing in food additives. This company has requested a license for the technology and has received approval of the trademark JETEX.

Wheat flour particle size distribution is a supporting method for wheat classification. The classification of U.S. wheats could be improved by applying additional objective tests to more effectively differentiate hard and soft wheats. Scientists at Fargo, North Dakota, measured the particle size distribution of hard and soft wheat flours by laser diffraction. Subsequently, they were able to predict flour particle size by near infrared reflectance spectroscopy based on reference values previously determined by laser diffraction. Both methods clearly differentiated hard and soft wheat flours. Information on flour particle size for different wheat types could provide additional support to the U.S. wheat classification system and could be used by commercial millers and bakers for establishing flour specifications for certain end products.

Agricultural byproducts absorb toxic and other regulated components of wastewaters. In parallel projects at Peoria, Illinois, and New Orleans, Louisiana, ARS scientists are solving problems of wastewater cleanup with low-value agricultural residues. Through the work at Peoria, fibrous byproducts from soybean, sugar beet and sugar cane processing can be turned into dye scavengers by a simple and inexpensive chemical treatment. At New Orleans, soybean and cottonseed hulls and defatted rice bran were shown to absorb up to 96 percent of zinc, chromium, cobalt, copper, or nickel salts from common wastewaters. After use, these byproducts could be disposed of either through composting and returning the product to the soil, controlled incineration, or through landfilling. Both locations are collaborating with industrial waste treatment companies to evaluate the commercial potential for these findings.

Conversion of carbohydrates in orange peel to ethanol. Orange juice production generates large quantities of peel and similar byproducts. These residues are dried and marketed as a cattle feed, but with marginal economic returns. Scientists at Winter Haven, Florida, have developed processes for enzymatic hydrolysis of carbohydrates in orange peel to soluble sugar and removal of

antimicrobial compounds in these hydrolysates. The orange peel hydrolysates were successfully fermented to ethanol by both yeasts and recombinant bacteria provided by the University of Florida. A preliminary economic evaluation of the overall process indicates that: enzymatic hydrolysis of orange peel and conversion of the resulting sugars to ethanol may provide economic benefits to the citrus processing industry.

Bacteriophage controls bacterial postharvest diseases of fruit. The bacterium *Erwinia ananas* causes brown spot of honeydew and muskmelon, and other bacteria in this group cause serious economic losses in many crops. At Weslaco, Texas, phages--naturally occurring viruses which attack and kill bacteria--were isolated from the environment using routine lab methods. All of the *E. ananas* strains were found to be susceptible to at least one phage isolate. The phages have been found to reduce inoculum density (bacterial populations) in preliminary tests. Use of phages to control brown spot outbreaks would reduce losses to shippers and growers and would set a precedent for the use of phages to control other bacterial diseases, both field and postharvest.

Vegetable oil derived ink vehicles are exceptionally biodegradable. Technologies that improve the environment by eliminating volatile organic compounds (VOC's) are a high priority. Lithographic (offset) newspaper ink (consisting of 100 percent soy or other vegetable oils and pigments), invented by scientists at Peoria, Illinois, is formulated without VOC's. Recent studies have demonstrated additional environmental advantages for this technology over those used for commercial newspaper ink vehicles (mineral oil and petroleum resin or vegetable oil and petroleum resin dispersants or pigment carriers). The ARS scientists have found that the 100 percent soy oil vehicle biodegrades more quickly and completely than the commercial vehicles. In a standard test for biodegradation, after 2 weeks, the vehicle from 100 percent soy oil was 90 percent degraded; a vehicle similar to current commercial soy inks (made of soy oil and petroleum resin) was 60 percent degraded, while a typical all-petroleum vehicle was only 20 percent degraded.

Toxic and/or flammable solvents in analyses for mycotoxins can be eliminated. The detection of aflatoxin contamination in grains has been traditionally accomplished by extracting the toxins from the grain matrix with copious amounts of organic solvents, followed by chromatographic analysis of the extract. Scientists at Peoria, Illinois, have developed a new method for the rapid removal of aflatoxins from field corn using an environmentally compatible compound, carbon dioxide. The method reduces the amount of toxic and flammable solvents used in the traditional isolation procedures and yields results equivalent to an organic solvent-based extraction procedure. This carbon dioxide-based technique overcomes many of the hazards formerly associated with the use and disposal of toxic and/or flammable solvents in a laboratory environment.

Treatment developed to meet Japanese quarantine requirements for U.S. apples. Market access for U.S. apples in Japan has been limited by a Japanese import quarantine on codling moth and lesser appleworm insects. A team of scientists from Yakima and Wenatchee, Washington; and Fresno, California, developed a two-component treatment to meet Japan's import quarantine requirements for "Red Delicious" and "Golden Delicious" apples. Confirmatory tests required by the Japanese government have been completed and tentatively accepted by Japan. It is anticipated that the new market in Japan for U.S.-produced apples could reach one million cartons per year, with an estimated value of \$35-\$40 million or more.

New passion-fruit clones selected with ability to survive freezing weather and retain ripe fruit on vine. Freezing weather at the northern end of the Florida citrus belt periodically kills or severely injures fruit trees, indicating the need for a more cold-hardy fruit crop. At Byron, Georgia, hybrid-passion fruit vines that combine genes from a cold-hardy species with a common tropical American passion-fruit withstood the cold of the March 1993 snowstorm and hard freeze; the vines resumed normal growth in spring 1993. These plants make it possible to develop varieties that can be grown in zones with sudden freezing weather, to the advantage of farmers living in those areas. Passion-fruit are

normally harvested after the ripe fruit falls to the ground, an expensive process that subjects fruit to early decay. A selection made at Miami, Florida, shows a new gene that lets fruit ripen on the vine for 6-18 days after maturity, thus affording easier, lower-cost methods of harvest possible.

RESEARCH IN HUMAN NUTRITION

Current Activities: This research is directed toward studying the effects of diet on healthy human volunteers of all ages. The objective of this research is to define nutrient requirements for pregnancy, growth and health of children, and nutrient function in the protection from disease of adults and the elderly. Particular emphasis is placed on the needs of infants at risk, protective factors in foods, dietary fat and carbohydrate needs to reduce risk of disease, and vitamin and mineral needs of individuals. The ARS chairs the Human Nutrition Coordinating Committee under the USDA Human Nutrition Policy Committee. This policy committee, composed of representatives from ten agencies, has an active liaison with the Nutrition Coordinating Committee of the National Institutes of Health.

Selected examples of recent progress:

Dietary folic acid intake is needed to reduce the risk of heart disease. Individuals with abnormally high levels of blood homocysteine, a naturally occurring amino acid, are at increased risk for developing heart disease. High levels of homocysteine can occur due to a deficient dietary intake of folic acid, a B vitamin found in green vegetables and some fruits. Scientists at San Francisco, California, and at the UCLA School of Public Health conducted a controlled study in which dietary folate equivalent to 12, 100, and 220 percent of the current Recommended Dietary Allowance (RDA) were fed to 10 healthy men to determine the folate intake that would prevent elevated homocysteine. Nearly half of the men developed high homocysteine levels after 4 weeks on the low folate intake. Some high levels persisted even after 2 weeks on the 100 percent RDA intake, but all decreased to normal within 9 days when the high intake was fed. The results indicate that the current RDA for folic acid may not be sufficient to prevent elevated homocysteine levels that increase the risk of thrombotic type heart disease.

Genetic diversity in patterns of fat deposition in humans. The amount and distribution of body fat, especially abdominal visceral fat, is a significant factor in health maintenance. Of major concern is the effect of weight reduction programs on the site of fat loss and the resulting effect on body composition. Scientists at Beltsville, Maryland, found significant differences in the amount of visceral adipose tissue in black and white women but no differences between binge and nonbinge eaters. Use of computerized tomography to quantitate the total amount and distribution of fat in the body allowed the scientists to follow changes in fat distribution during a 6-month weight reduction study. The results may explain the differences in morbidity and mortality between black and white women and are of particular benefit to African-American women.

Differences in calcium metabolism may reveal why African-Americans have higher bone mass than whites. Studies have revealed that African-Americans and Mexican-Americans have greater bone mass and less osteoporosis than European-Americans. ARS investigators at Boston, Massachusetts, examined healthy women and compared their fractional calcium retention and production of the calcium-regulating hormones during periods of high and low calcium intakes. African-Americans had higher levels of vitamin D than European-Americans on both diets and a greater increase after calcium restriction. These findings raise the possibility that African-Americans have a lower excretion of vitamin D, which may account for their higher levels of the vitamin and more favorable bone status. This information may prove to be important in establishing the dietary requirements for calcium and vitamin D in older adults.

Bioelectrical impedance spectroscopy (BIS) for monitoring fluid volume changes during pregnancy. Changes in body composition reflect changes in nutritional status and, often, in health status. Body composition measurements may be affected and give erroneous results by changes in the body's total water volume, specifically the extracellular fluid volume. In healthy individuals these two fluid compartments are tightly controlled; however, in cases of nutritional compromise or ill health, extracellular fluid will increase the total body water volume. ARS researchers at San Francisco, California, and Houston, Texas, cooperated with scientists of the University of California at Berkeley, in the use of the BIS technique to noninvasively measure changes in these fluid volumes of women before, during, and after pregnancy. The BIS technique was compared with laboratory isotope tracer methods and found to give equivalent results. This noninvasive BIS technique shows great promise for the quick, accurate, and noninvasive assessment of body fluid changes and for enhanced nutritional and health status.

Trans fatty acids compared with saturated fatty acids in effects on blood lipids. Vegetable oil processing involves partial hydrogenation, a chemical process that leads to the formation of trans fatty acids that have been suggested to carry a risk of cardiovascular disease. In a study at Beltsville, Maryland, trans fatty acids caused plasma total and LDL-cholesterol (bad cholesterol) elevations similar to, but no greater than, a diet with equally high levels of saturated fatty acids. At levels of trans-intake equal to the average intake in the U.S. diet, there were only minor effects on HDL-cholesterol (good cholesterol) compared with a highly desirable diet having high levels of naturally occurring unsaturated fatty acids. Thus, partially hydrogenated vegetable oils may continue to be consumed in moderation as part of a healthy, fat-controlled diet. Results of this study are important to consumers, farmers, and manufacturers in the oilseed industry who desire to produce healthy foods.

Plant sources in the U.S. diet provide 75-85 percent of needed omega-3 fatty acids. Linoleic and linolenic acids are the predominant polyunsaturated fats in the U.S. diet. Animal studies have indicated that a balance between omega-6 and omega-3 essential fatty acids in dietary fats is critical to good health. Research was conducted to determine if animal data accurately reflect the metabolism of these fatty acids in human subjects; to conclude if ratio or amount of these fats in the diet controls the balance; and to determine if a normal U.S. diet contains sufficient omega-3 fatty acids to meet estimated requirements. Human subjects were placed on diets containing different amounts of polyunsaturated fats for 2 weeks. The results indicate that animal data are a partial substitute for human data; that the amounts of the omega-3 and omega-6 fatty acids in diet are more important than the ratios; and that the amount of linolenic acid in the U.S. diet provides 75-85 percent of the omega-3 fatty acids estimated to be needed in adult diets.

An indicator of copper status is identified. Inadequate copper status may contribute to the occurrence of ischemic heart disease in humans. However, confirmation of this suspected relationship has been constrained by the lack of a method to discriminate between adequate and inadequate copper status. ARS scientists at Grand Forks, North Dakota, have discovered that the copper-dependent enzyme cytochrome C oxidase in platelets (a cell found in blood) is a sensitive indicator of copper status. This new information may be pivotal in establishing whether an inadequate intake of dietary copper is a major contributor to the occurrence of ischemic heart disease and showing that copper is an important nutritional concern for U.S. citizens.

Stearic acid, a component of meat, promotes iron utilization. Iron deficiency is a significant nutritional problem worldwide. Identification of the factor in meat that promotes iron absorption and utilization in humans would help in making recommendations to alleviate this deficiency. ARS researchers at Grand Forks, North Dakota, have obtained evidence that stearic acid (a fatty acid found in meat, especially beef) is such a meat factor. In comparison tests with safflower oil, stearic acid--added to the diet of iron-deficient dogs--doubled radioiron absorption and significantly increased the movement of iron in the blood and the

production of red blood cells. Thus, while red meat supplies iron, it also contains a substance that enhances iron utilization by the body. People who include red meat in their diets are, therefore, observing a dietary practice that is important in preventing iron deficiency.

Long-term care for the elderly. The present system of providing and paying for long-term care is fragmented and confusing. ARS family economists at Beltsville, Maryland, reported that over eight million elderly Americans will need some type of long-term care by the year 2000. To help with their needs, numerous public programs, particularly Medicaid and Medicare, have been developed and expanded. Public programs paid for 50 percent of nursing home care and 74 percent of home health care in 1990. The recent availability of long-term care insurance policies through private companies has not yet had a big effect on long-term care since only 3 percent of the elderly had policies by late 1991.

Girls need more calcium at a young age. Puberty is recognized as a period of maximal growth and bone formation. As much as 97 percent of total body calcium may be accumulated in girls before they are 16 years of age. At Houston, Texas, ARS scientists measured the rate of calcium deposition in bone and the size of the exchangeable calcium pool in bone in 50 girls, ages 5 to 16 years of age. The lowest bone calcium deposition rates were found in the girls who were more than 24 months postmenarche. Current recommendations for calcium intake in children, however, do not suggest an increased intake until 11 years of age--well after the onset of puberty in many girls. Furthermore, it is unlikely that increasing calcium intake postpuberty would significantly increase bone calcium deposition rates, and hence, density. The results suggest that dietary patterns that will promote mineralization in girls should be encouraged throughout the early/midpubertal period.

Folate, vitamin B12, and vitamin B6 status are associated with plasma homocysteine in older Americans. Recent studies have demonstrated associations between some cardiovascular and neuropsychiatric diseases and elevated levels of homocysteine, a nonprotein forming amino acid. While some cases of hyperhomocysteinemia may have a genetic basis, some data have indicated this condition may be attributed primarily to nutritional status. ARS scientists at Boston, Massachusetts, examined survivors (aged 67-96 years) from the original Framingham Heart Study population. One-quarter of the people had higher than normal homocysteine levels and two-thirds of those could be attributed to low or marginal status of folate, vitamin B12, and/or vitamin B6. A strong case can now be made for the prevention of the marginal deficiencies of these vitamins, common among older people, as they may be linked to the risk of cardiovascular disease, the leading cause of death in this population.

Low dietary carotene increases oxidative damage. Eating foods high in carotenes (such as carrots, squash, and tomatoes) is associated with reduced risk of getting certain cancers. Scientists have speculated that carotenes might protect us from cancers by preventing oxidative damage, but the only established role of carotenes in humans is to serve as sources of vitamin A. ARS scientists at San Francisco, California, have completed a study in which a diet low in carotenes (but with adequate vitamin A) was fed to healthy adult women for 10 weeks; the same diet with added carotenes was then fed for 4 weeks. Oxidative damage increased while the women were fed the low carotene diet, then decreased after they were given carotenes. These results suggest that carotenes may form an important part of the antioxidant defense system that protects against oxidative damage, a known risk factor for cancer.

Moderate alcohol consumption linked to hormone changes in women. Changes in the exposure of breast tissue to estrogen and other hormones may be one of the key processes by which diet affects the risk of developing breast cancer. Several dietary factors have been shown to affect blood estrogen levels. The potential role of alcohol consumption has been a prominent consideration in the etiology of breast cancer and is particularly important because it is a risk factor that can be modified. Studies by ARS scientists at Beltsville, Maryland, have shown that moderate alcohol consumption increased estrogen and other hormone levels in

premenopausal women consuming a controlled diet. Increases in hormones occurred in various phases of the menstrual cycle but were especially prominent around the time of ovulation. Thus, increased risk of breast cancer due to moderate alcohol consumption may be related to increased exposure of breast tissue to estrogen.

A simple strategy improves weight gain in nursing low birth weight infants. Low birth weight infants fed their mother's milk often gain weight at a lower rate after birth than the rate of gain in utero. The low rate of weight gain may result from a limited intake of nutrients, despite human milk fortification with added protein, minerals, and carbohydrates. The lipid content of hindmilk is known to be 2 to 3 times greater than that of foremilk. To enable weight gain equivalent to in utero gains, human milk was fortified with its hindmilk fraction to increase the endogenous lipid content. When infants were fed their mother's milk fortified with the hindmilk fraction, their weight increased significantly; the increment in fat concentration of the hindmilk was directly related to the increase in the rate of weight gain in all infants. This simple lactoengineering technique has great potential for supporting weight gain in low birth weight infants.

Improving iron and zinc content of vegetables for human consumption. Iron deficiency anemia is surprisingly widespread in the U.S., especially among young pregnant women. The problem is complex, with too little iron in the diet and too little of the iron that is eaten being absorbed by the body. ARS scientists at Ithaca, New York, have identified the factors directly limiting the uptake of iron from soil into plants. They have also identified an essential amino acid that increases the efficiency of zinc absorption by the body. This amino acid is normally present in grains, but can be increased by plant breeding. This research increases the possibility of breeding crops that contain greater amounts of essential mineral nutrients, with better availability for absorption. This research has a direct effect not only on human nutrition in the U.S., but also throughout the world.

Oils rich in either polyunsaturated or monounsaturated fatty acids can be substituted for saturated fatty acids as part of a cholesterol-lowering diet. The debate continues as to whether fat in the diet should be relatively high in monounsaturated or polyunsaturated fatty acids. ARS researchers at Boston, Massachusetts, tested 15 middle-aged and older adults with high low-density lipoprotein cholesterol (LDL-C) concentrations. The test participants received low-fat diets in which two-thirds of the fat calories were given either as canola, corn, or olive oil. Plasma cholesterol and LDL-C levels declined in each group, but the change was greater with canola and corn-oil diets. Although differential effects were seen after the consumption of these three oils in some plasma lipid measures, none of these oils had a significant advantage in terms of altering the overall lipoprotein profile. Oils rich in either polyunsaturated or monounsaturated fatty acids can be used to substitute for saturated fatty acids, when there is sufficient linoleic acid.

Copper deficiency impairs the ability to dissolve blood clots. Thrombosis, or the presence of a blood clot blocking a blood vessel or formed in a heart cavity, is a contributing factor to coronary heart disease. Blood clots in other critical organs also can cause death or other pathological consequences. Researchers at Grand Forks, North Dakota, have found that copper-deficient mice have an impaired ability to dissolve blood clots. This finding suggests that inadequate copper nutrition can contribute to the development of thrombotic lesions associated with coronary heart disease; this is further evidence that consuming a diet adequate in copper is helpful for maintaining healthy hearts and blood vessels and preventing clotting disorders.

Improved in vitro method for assessing iron bioavailability. Iron deficiency anemia is generally considered the most widespread nutritional deficiency in the U.S. This is due, in part, to the fact that only 5 to 10 percent of dietary iron is bioavailable (available for absorption and utilization). Improvement of iron bioavailability has been hampered by poor understanding of the factors that regulate iron absorption. ARS scientists at Ithaca, New York, have developed a

model system for estimating bioavailability. The system involves simulated digestion of a food or a meal followed by measurement of iron uptake by intestinal epithelial cells grown in single-layer cell cultures. This model should prove very useful in improving our understanding of the factors that limit iron bioavailability and could provide an inexpensive means of screening foods and/or meals for iron bioavailability. Improved knowledge of the factors limiting bioavailability and an inexpensive screening method would contribute to a reduction in the incidence of iron deficiency anemia.

Measurement of total dietary fiber in fruits and vegetables is simplified. Dietary fiber is a component of many foods--especially fruits and vegetables--that may reduce the risk of cardiovascular disease and certain cancers. Data on the fiber content of foods must be easy to measure as well as accurate and precise. Scientists at Beltsville, Maryland, have developed simplified procedures for measuring total dietary fiber in fruits and vegetables. In most foods, these procedures in the past have required several tedious and laborious steps to remove such components as starch and protein before fiber can be determined. Since many vegetables and most fruits contain little or no starch, those steps designed to remove starch were eliminated from the fiber determination. The resulting method is shorter, cheaper, and produces less hazardous chemicals. This methodology will be very useful to commercial analytical laboratories and commercial laboratories in fulfilling the requirements of the Nutrition Labeling and Education Act.

RESEARCH IN INTEGRATION OF AGRICULTURAL SYSTEMS

Current Activities: The solution of important national problems faced by agriculture requires the integration of components of research from all areas of the agricultural and natural resource system. These include soils, water, climate, plants, insects, diseases, animals, and people. A primary objective of systems research is to package research results into products that aid or improve the timeliness and accuracy of decisions made by managers of agricultural systems and their impact on society as a whole. Systems research can result in lower input costs, better quality products, more efficient resource use, reduced environmental impact, and improved sustainability of agricultural production systems to meet long-term societal needs.

Systems research teams are typically composed of scientists from several disciplines and are often stationed at more than one location. Team members are linked together through national information networks to share concepts and databases required to build models. Mathematical models are one of several systems tools that can serve as surrogates for the real system on which experiments can be performed to estimate the system's response over time to alternative environments or management practices. It is usually not possible to perform such experiments on the real system because it is too costly, or requires too much time to obtain the results. The accuracy with which the models represent the real systems is tested through validation experiments. Validated models serve as predictors of system performance and can, therefore, be used in the decisionmaking process as tools to estimate how a system can best be managed to achieve desired goals.

Selected Examples of Recent Progress:

A sensor that checks organic matter and moisture levels in soil has been redesigned to apply herbicides. Precision farming requires accurate methods of sensing soil properties so that variable rates of herbicides can be applied. The tractor-mounted sensor bases its measurements of organic matter and moisture on the amount of light reflected by the soil, providing information in seconds and permitting variations in herbicide rates, depending on need. The redesigned sensor is entirely self-contained; the original sensor, developed by an ARS engineer and Agmed, Inc., was slower and required a separate computer. ARS shares the patent for the original sensor with Agmed. Precision farming

techniques are being evaluated in Missouri at the Management Systems Evaluation Area water quality site and on other farms.

Land use planning tool for addressing multiple, conflicting criteria is nearing reality. Agricultural and other land use planners need to consider how numerous factors relate to and interact with each other. In some situations, these factors relate to economically and socially acceptable food and fiber production while enhancing the environment. Scientists have developed a prototype of a computerized tool that uses natural resources databases and simulation models, including those pertaining to agriculture and economics, to place rational, repeatable values on many factors under consideration. With this tool, pros and cons of alternative land management approaches may systematically be weighed against each other while at the same time taking into account the differences in opinion among diverse interest groups.

Crop condition reports associated with Midwest floods have been developed from weather satellite data. Crop condition reports are used extensively by the USDA to assess the effects of droughts, floods, and other natural disasters on the farm economy. Traditional ground-based surveys are expensive and often impractical. The products of this research, developed from spectral data provided by NOAA's weather satellites, permit more efficient monitoring of crop conditions. Plant development and vigor are monitored using a greenness vegetation index. A biweekly map of comparative crop condition is developed by comparing the index for the current year with the long-term "normal" condition. This approach was used to assess the effects of the 1993 flooding in the Upper Mississippi Valley on the affected area and on crop damage. Information generated from the satellite data was used by the Agriculture Statistics Board and the Office for Economic Analyses to qualitatively assess crop conditions in the flooded areas from the August, September, and October reports.

Image-integrated computer cataloging system is developed for maize germplasm. Until recently, techniques for measuring morphological features of maize ears and kernels were unwieldy and labor intensive; e.g., visual measurement, hand-recording, photographing, and storing in cabinets. ARS scientists at Ames, Iowa, have now developed a computer imaging acquisition system for providing uniform illumination and analysis. The computer images and software are being integrated to facilitate documentation and retrieval of maize images and measurement data. With suitable modifications, the process and techniques can be applied to other types of germplasm.

The cotton management expert system is integrating outputs of the production and insect models in a more comprehensive system. The cotton production computer decision model considers effects of a growing spectrum of crop varieties, climate and soil factors to predict yields based on management of these factors. However, it has become increasingly apparent that cotton yields are commonly reduced significantly by insect pests. To estimate this reduction the "rule based Wholistic Insect Management System (rbWHIMS)" has been developed and is now being integrated into the cotton production model to produce an expanded expert system in which the best coordinated sets of management practices can be identified. This model and expert system is undergoing continual evolution based on data from research headquarters at Mississippi State, and about 500,000 acres of cooperators' cotton lands where their performance is being evaluated.

Development of an expert advisory system for integrated management of wheat diseases. A computerized system for integrated management of wheat diseases was developed for the Pacific Northwest (PNW) by ARS scientists in Pullman, Washington. The program is referred to by the acronym "MoreCorp" (Managerial Options for Reasonable Economical Control of Rusts and Other Pathogens), and is designed to provide various disease management options in different agronomic zones of the PNW. The system is based on more than 30 years of research on epidemiology and control of wheat diseases and recent technological advances in the use of computers. MoreCorp predicts diseases based on cultivar characteristics, prevailing weather, geographical regions, agronomic zones, crop managerial practices (i.e., crop rotation, tillage method, irrigation methods,

planting date, and fertilizer application), crop history, and disease history. MoreCrop can be adapted for use in other regions of the world and can serve as a prototype in developing a total, sustainable wheat management program. The knowledge used for developing the system has prevented major disease epidemics in the past and multimillion dollar losses.

Technology to utilize Geographical Information System (GIS) and Geographical Position System (GPS) for site specific farming has been developed. Since most farm fields are not homogeneous and water and chemicals are normally applied at constant rates this normally results in too much being applied in some areas and not enough in others. Too much pesticide and fertilizer may cause leaching and ground water contamination and too little causes inadequate pest control and reduced crop yields. ARS engineers have developed technology that will determine yield variability within a field on a realtime basis using a global positioning system combined with on-board weighing devices. The data are put into a geographical information system containing a variety of data about the soil, crop and pest populations that will be used to control seed population and chemical inputs during the next production cycle.

Expert system for management of insect pests in stored grain. An expert system for stored grain insect management was tested in an ARS pilot project. Over a three-year period, 36 bins of wheat were sampled for insects in Oklahoma and Kansas. The expert system was 88 percent accurate in predicting when bins would or would not become infested with insects. The computer program, called stored Grain Advisor, used mathematical models to predict insect population dynamics. Whenever possible, it emphasizes the use of non-chemical methods to inhibit insect growth, such as cooling of the grain with aeration fans. In many cases, the system demonstrated that grain can be stored safely without the use of synthetic chemicals. Farmers using this system can make better management decisions, resulting in higher quality grain, reduced insecticide usage, and less storage risk.

AGRICULTURAL RESEARCH SERVICE

Buildings and Facilities:

For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities as necessary to carry out the agricultural research programs of the Department of Agriculture, where not otherwise provided, [\$32,743,000] \$25,700,000, to remain available until expended (7 U.S.C. 2209b): Provided, That hereafter, facilities to house bonsai collections at the National Arboretum may be constructed with funds accepted under the provisions of Public Law 94-129 (20 U.S.C. 195) and the limitation on construction contained in the Act of August 24, 1912 (40 U.S.C. 68) shall not apply to the construction of such facilities: Provided further, That funds may be received from any State, other political subdivision, organization, or individual for the purpose of establishing any research facility of the Agricultural Research Service, as authorized by law.

AGRICULTURAL RESEARCH SERVICEBUILDINGS AND FACILITIES

Appropriation Act, 1994.....	\$32,743,000
Budget Estimate, 1995	25,700,000
Decrease in Appropriation.....	<u>-7,043,000</u>

SUMMARY OF INCREASES AND DECREASES

(On basis of Appropriation)

Facilities	1994 <u>Estimated</u>	Program <u>Changes</u>	1995 <u>Estimated</u>
Arkansas: National Rice Research Center, Stuttgart	\$3,828,000	\$-3,828,000	--
California: U.S. Horticultural Crop and Water Management Research Laboratory, Parlier	2,630,000	-2,630,000	--
Western Regional Research Center, Albany	1,161,000	+4,439,000	\$5,600,000
D.C.: U.S. National Arboretum	500,000	-500,000	--
Florida: Horticultural Research Laboratory, Ft. Pierce ...	2,900,000	-2,900,000	--
France: European Biological Control Laboratory, Montpellier	--	+2,600,000	2,600,000
Illinois: National Center for Agricultural Utilization Research, Peoria	--	+4,300,000	4,300,000
Iowa: National Swine Research Center, Ames	4,524,000	-4,524,000	--
NADC-Necropsy/Incinerator, Ames	3,900,000	-3,900,000	--
Louisiana: Southern Regional Research Center, New Orleans	2,667,000	+533,000	3,200,000
Maryland: Beltsville Agricultural Research Center, Beltsville	a	+5,000,000	5,000,000
Mississippi: National Center for Warm Water Aquaculture, Stoneville	1,716,000	-1,716,000	--
National Center for Natural Products, Oxford	4,382,000	-4,382,000	--
New York: Plum Island Animal Disease Center, Greenport..	1,475,000	+3,525,000	5,000,000
Ohio: Demonstration Greenhouse, Lucas County ..	200,000	-200,000	--
South Carolina: U.S. Vegetable Laboratory, Charleston	909,000	-909,000	--

<u>Facilities</u>	<u>1994 Estimated</u>	<u>Program Changes</u>	<u>1995 Estimated</u>
Texas: Plant Stress and Water Conservation Laboratory, Lubbock	551,000	-551,000	--
Subtropical Agricultural Research Laboratory, Weslaco	<u>1,400,000</u>	<u>-1,400,000</u>	<u>--</u>
TOTAL AVAILABLE	<u>32,743,000</u> b	<u>-7,043,000</u>	<u>25,700,000</u>

PROJECT STATEMENT
(on basis of available funds)

PROJECT	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	AMOUNT	Staff Years	AMOUNT	Staff Years		AMOUNT	Staff Years
Total Obligations..	\$38,362,193	- -	\$40,000,000	- -	\$-5,000,000	\$35,000,000	- -
Unobligated Balances:							
Available, Start of year	-59,877,289	- -	-56,029,096	- -	7,257,096	-48,772,000	- -
Available,End of year.....	56,029,096	- -	48,772,096	- -	-9,300,096	39,472,000	- -
Total Available or Estimate.	34,514,000	- -	32,743,000b	- -	-7,043,000(1)	25,700,000	- -

- a In FY 1994, \$19.7 million was appropriated for renovation and repair work at the Beltsville Agricultural Research Center under the Department's Rental Payments account.
- b Includes \$8,460,000 for projects proposed for rescission. This proposal would rescind funds and congressional earmarks directing resources to be used for specific new construction. The remaining resources would be used to finance renovation projects at the Agency's regional research centers and address serious environmental and safety defects at other ARS facilities.

BUILDINGS AND FACILITIES

(1) A net decrease of \$7,043,000 for Buildings and Facilities, consisting of:

- (a) An increase of \$13,100,000 for the modernization of facilities at selected ARS Regional Research Centers: Albany, California (\$5.6 million), New Orleans, Louisiana (\$3.2 million), and Peoria, Illinois (\$4.3 million).

Need for Change. Outmoded facilities are hampering the ability of ARS scientists to conduct advanced research. The Agency has also experienced problems in attracting the best scientists when they are presented with old, deteriorated laboratory facilities. Existing facilities contain numerous building and environmental code deficiencies. Additional resources need to be targeted toward the Agency's ongoing efforts to renovate and modernize ARS' major national research centers in Albany, California, New Orleans, Louisiana, and Peoria, Illinois. An investment of resources is essential for these centers to regain the scientific capacity necessary to deliver viable and timely research discoveries that contribute to the development of new markets at home and abroad.

All major building systems at the Albany, New Orleans, and Peoria research centers--heating, ventilation, air-conditioning, electrical, roofs, and infrastructures (paving, steam and water lines, and waste treatment disposal systems)--have either reached or passed their useful life expectancy. Other existing facility deficiencies involving safety and health needs, such as asbestos removal and building code upgrade requirements, need to be corrected.

Nature of Change. Additional appropriations are required in FY 1995 to allow ARS to proceed with the phased modernization efforts at the Albany, California Western Regional Research Center (WRRRC), New Orleans, Louisiana Southern Regional Research Center (SRRRC), and Peoria, Illinois National Center for Agricultural Utilization Research (NCAUR). Phasing construction of major renovations is necessary in major laboratories while individual laboratories or wings of laboratories are being renovated since the Agency has virtually no swing space in which to house displaced scientists. The major needs for these centers in FY 1995 are as follows:

- o WRRRC Chemical Wing. Construction of Phase 7 of the modernization program--\$5.6 million.

Construction will involve the renovation of laboratories, upgrading of utilities, new HVAC system, replacement of casework, upgrading of electrical system, fire safety improvements to meet current codes, asbestos abatement and site improvements. In FY 1994, \$1,161,000 was appropriated toward construction of Phase 7. An additional \$5.6 million is required in FY 1995.

- o SRRRC Chemical Wing. Construction of Phase 7 of the modernization program--\$3.2 million.

The modernization of the Chemical Wing will involve the renovation of laboratories, new HVAC system, new casework, electrical upgrade, fire safety improvements to meet current codes, and asbestos abatement. Funding of Phase 7 (\$3.2 million) will complete the work in the Chemical Wing.

- o NCAUR Semi-Works building & North Wing - \$4.3 million. Design has been completed for the phased renovation of the Semi-Works building and the North Wing. In FY 1995, \$4.3 million will be needed to construct the renovations to the Semi-Works building, as well as begin the first phase of a multi-phase renovation to the North Wing. The requested amount, plus the \$1,545,000 appropriated in FY 1993 for design of the Chemical Wing will provide for the funds required for construction of this phase.

(b) An increase of \$5,000,000 for modernization of facilities at the Beltsville Agricultural Research Center, Beltsville, Maryland.

Need for Change. The Beltsville Agricultural Research Center (BARC) was established in 1910. Current land resources total 7,000 acres and accommodate more than 800 buildings and structures in support of ARS research programs, including natural resources and environmental sciences, plant and animal productivity, product quality, and human nutrition studies. The ARS staff at Beltsville totals about 1,500 including 400 scientists.

BARC is the largest research center in ARS and is the largest agricultural research center in the world in terms of program scope and concentration of scientists. BARC has long enjoyed a worldwide image of preeminence in the agricultural sciences because of its long history of research quality, contributions to agriculture, and prominent scientists. It is the headquarters for ARS' national program leadership. In addition, 18 other Federal and State agencies such as the FDA, EPA, FGIS, and FSIS have offices or laboratories at BARC, or have facilities adjacent to the center.

Most of the major ARS facilities and utility support systems at BARC were built in the 1930's and 1940's. Deterioration and obsolescence of these 50-year-old facilities are hampering both the scientific research and the image of BARC as the preeminent agricultural research center of the USDA.

An architectural-engineering consultant has completed a comprehensive study on BARC and produced an overall master plan with cost estimates for the remaining facility modernization work. Execution of this plan, which was to be phased over an 11-year period, was to cost an estimated \$205 million. However, inconsistent funding levels have resulted in a larger and more costly program.

ARS is currently implementing the consultant's recommendations through a phased funding process. The consultant's study specified the necessity for BARC's modernization to incorporate a mix of both construction of new structures and renovation of

existing facilities. Over 200 outmoded structures will eventually be demolished.

Nature of Change. Funds are needed in FY 1995 to continue with the vigorous implementation of the BARC modernization plan. ARS proposes \$5 million specifically for:

- o Building 004. Building 004 is currently used for offices, laboratories, and support space. It houses the Plant Sciences Institute's Fruit Laboratory, Florist and Nursery Crops Laboratory, and the Vegetable Laboratory. The building will be renovated to provide modern, state-of-the-art laboratories, offices, and support space. It will be used to house the Product Quality Development Institute's Horticultural Crops Quality Laboratory. Design is scheduled for FY 1994. Construction is scheduled for FY 1995 and is estimated at \$5 million.

- (c) An increase of \$3,525,000 for immediate environmental and facility deficiency needs at the Plum Island Animal Disease Center, Greenport, New York.

Need for Change. The Plum Island Animal Disease Center (PIADC) was established by an Act of Congress in 1954. It is located on a federally-owned 840-acre island located about two miles off the eastern tip of Long Island, New York. PIADC is the only site in the United States authorized by Congress to carry out research and diagnostic work on foreign animal diseases (e.g., foot-and-mouth disease and African swine fever) which are an ongoing threat to the U.S. livestock industry.

In 1989, ARS and APHIS began to develop an overall plan for the repair and maintenance of the buildings and supporting infrastructure at PIADC. Environmental concerns were also addressed. Engineering studies identified the need for repairs and improvements to correct major code violations and provide mandatory safeguards against power failures.

Based on these studies, projects which must be completed in the near term were selected for funding in FY 1995. Longer term facility requirements will be reviewed in the context of scientific advances and other operating considerations which may provide alternatives to the continued operation of Plum Island.

Nature of Change. The additional funds will be used for infrastructure repair and environmental compliance projects requiring immediate repair or replacement. These are necessary to bring facilities in compliance with Federal, State, and local environmental laws, regulations, and standards.

- o Aboveground Fuel Tank Repairs. Upgrade the two existing 210,000 gallon fuel tanks to meet current regulations. A study was initiated in FY 1992 to determine the scope of repairs. In FY 1995, design and construction is estimated at \$1,500,000.

- o Orient Point Harbor Repair. In FY 1991, ARS completed a design addressing repairs to the Orient Point harbor in three construction phases. There is a pressing need to repair the eastern section of the harbor due to a failing bulkhead. Construction of Phase 1 is estimated at \$1,500,000 in FY 1995. To complete Phases 2 and 3, additional costs are estimated at \$2,700,000.
 - o Electric Submarine Cable. The existing electric submarine cable was last replaced in 1983. While the actual condition of this cable is unknown, the expected life is estimated to be eleven years. This cable is the single source of primary power to the island. In FY 1995, design and construction is estimated at \$1,350,000.
 - o Miscellaneous Environmental Projects. In FY 1993, ARS issued a contract to conduct a preliminary assessment to identify potential environmental liabilities at PIADC. It is expected that the study will identify environmental problems that need to be addressed. In FY 1995, ARS is requesting \$650,000 to address problems that are identified.
- (d) An increase of \$2,600,000 for construction of a new facility for the European Biological Control Laboratory, Montpellier, France.

Need for Change. The Biological Control of Weeds Laboratory - Europe, established in Rome in 1958 and the European Parasite Laboratory established near Paris in 1919, were combined in September, 1991 as the European Biological Control Laboratory in Montpellier, France. This laboratory is one of four overseas biological control laboratories of the Agricultural Research Service.

Many of the insect pests and weeds in the United States are of European or Asian origin. Many have become problems of national importance. The insect pests attack crops and domestic animals, ornamentals, and forests; the weeds infest millions of acres of pasture, crop lands, and natural areas. Annually, millions of dollars of losses are caused by immigrant pests.

The mission of the European Biological Control Laboratory in Montpellier is to discover, conduct research on, and introduce suitable natural enemies (insects, mites, and pathogens) into the United States to abate these insect pests and weeds. Using biological control strategies is a component of ARS' overall plan to reduce pesticide use. Pesticide reduction is a major administration initiative.

The Laboratory's research and service program is in support of U.S. based ARS laboratories and APHIS. The Laboratory cooperates extensively with biological control specialists in State agencies and universities throughout the United States and throughout the world. The Laboratory serves as the focal point of ARS exploration in Eurasia, the Middle East, North Africa, and as a source of information on biological control activities.

The continued success of the European Biological Control Laboratory depends upon construction of an appropriate facility. The current facilities which were to be "temporary" are crowded and dispersed. It represents a serious impediment to the Laboratory's operations.

Nature of Change. Presently, the European Biological Control Laboratory's facilities consist of:

- o Laboratory/office space (4300 sq. ft) in one building on one site.
- o Laboratory/office space (1900 sq. ft) in another building at another site.
- o Greenhouses, auxiliary quarantine gardens, temporary laboratories, storage and a shop in five other, rented locations.
- o A quarantine facility (400 sq. ft).

The Laboratory does not presently have a quarantine greenhouse. This represents a serious deficiency for the program.

Funding in the amount of \$2.6 million is requested to proceed with the construction of a new laboratory. To date, \$331,000 has been spent for the purchase of a new laboratory construction site in Montpellier, and \$100,000 has been committed for professional services.

The planning and design for the new laboratory is in the process of being awarded. This is projected to cost \$400,000, which will be funded from the FY 1993 appropriation for miscellaneous facilities. The planning/design project will be completed within one year of award.

- (e) A net decrease of \$32,743,000 to delete funds provided in the FY 1994 Appropriation Act.

Need for Change. Funds for projects contained in the FY 1994 Appropriation Act are available until expended and are not required in FY 1995.

Agricultural Research Service
Status of Construction Projects as of January 1994

Status of research facilities authorized or funded in prior years and reported as uncompleted in the 1994 Explanatory Notes, is as follows:

NOTE: Design criteria, provided by ARS, specifies the program requirements for the facility and forms the basis for negotiation of architect-engineer contracts. Diagrammatic drawings or concept drawings provide the basis for the first review of the architect's design. Tentative drawings or architect's design are provided by the architect for firming up cost estimates and basis for developing the completed, and final working drawings.

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
<u>Arkansas, Stuttgart Rice Research Center</u>	1991 Planning	\$222,997	Completion of design for the new facility is anticipated in the Third Quarter of FY 1994.
	1992 Planning	729,000	
	1993 Construction	702,000	
	1994 Construction Total	3,828,000 5,481,997	
<u>California, Riverside U.S. Salinity Laboratory</u>	1987 Planning	1,000,000	Construction of the new facility is scheduled for completion in the Fourth Quarter of FY 1994.
	1989 Construction	900,000	
	1990 Construction	2,000,000	
	1991 Construction	5,049,934	
	1992 Construction	5,300,000	
	1993 Construction Total	3,980,000 18,229,934	
<u>California, Albany Western Regional Research Center</u>	1994 Construction	1,161,000	Funds were appropriated for Phase 7. Construction of Phase 7, which is estimated at \$5.6 million, is on hold until the project is fully funded.
<u>California, Parlier Horticultural Crop Research Laboratory and Water Management Research Laboratory</u>	1994 Planning	2,630,000	Pre-design contract is scheduled for award in the Second Quarter of FY 1994.

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
District of Columbia U.S. National Arboretum, Brickyard Restoration	1989 Reprogrammed for Design and Construction	\$2,000,000	Design for the Brickyard Restoration project is complete. Phase 1 of construction including asbestos abatement and stabilization of two kilns and two stacks was awarded in the Fourth Quarter of FY 1993, with completion anticipated in the Third Quarter of FY 1994.
Water System Upgrade	1992 Planning 1993 Construction 1994 Construction	400,000* 400,000* 400,000* <u>500,000</u> 1,700,000	The design for the new water system is complete. Phase 1 of construction is in progress with completion anticipated by the Third Quarter of FY 1994. Phase 2 of construction is scheduled for award in the Second Quarter of FY 1994.
Florida/Hawaii Emergency Relief	1992 Planning and Construction	15,000,000	Damaged facilities have been repaired and made functional at an expenditure of \$1.9 million. The Agency is presently considering options regarding the effective utilization of remaining funds.
Florida, Ft. Pierce Port/Cultural Research Laboratory	1994 Planning	2,900,000	Pre-Design contract is scheduled for award in the Third Quarter of FY 1994.
Georgia, Athens Poultry Disease Laboratory	1992 Planning 1993 Construction Total	400,000 677,000 <u>1,077,000</u>	The design for the new facility, which is 35% complete is currently on hold pending determination of future course of action by the Agency.
Illinois, Peoria National Center for Agricultural Utilization Research	1992 Planning 1993 Planning Total	1,825,000 1,545,000 <u>3,370,000</u>	The design for the Pilot Plant and the Semi-Works Building is complete. Subject to Congressional approval, the Agency is considering option to redirect the FY 1993 planning funds for the Chemical Wing towards initial construction of the Semi-Works Building as a means of facilitating modernization program.

* Appropriated under ARS' Salaries and Expense account.

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
<u>Iowa, Ames</u> <u>National Animal Disease</u> <u>Center, Necropsy</u>	1991 Planning	\$299,996	The design for a stand-alone necropsy facility with an incinerator is complete. Construction award is anticipated in the Third Quarter of FY 1994.
	1994 Construction	3,900,000	
		<u>4,199,996</u>	
<u>National Swine</u> <u>Research Center</u>	1992 Planning	1,800,000	Design contract for the Office/Laboratory was awarded in the Fourth Quarter of FY 1993 with completion anticipated in the Fourth Quarter of FY 1994. Award for the design contract for the Farm Complex is anticipated in the Third Quarter of FY 1994.
	and Construction		
	1993 Planning	1,524,000	
	and Construction	4,524,000	
	1994 Construction	<u>7,848,000</u>	
	Total		
<u>Louisiana, New Orleans</u> <u>Southern Regional</u> <u>Research Center</u>	1992 Construction	1,950,000	Phases 1 and 2 of construction are complete. Construction of Phases 3, 4, and 5 is currently in progress. The FY 1993 appropriation of \$1,651,000 is being utilized for the design and construction of required site repairs consisting of roads, curbing, drainage, etc., for which construction is scheduled for award in the Second Quarter of FY 1994. The FY 1994 appropriation of \$2,667,000 will be applied to the construction of Phase 6.
	1993 Planning	1,651,000	
	and Construction	2,667,000	
	1994 Construction	<u>6,268,000</u>	
	Total		
<u>Maryland, Beltsville</u> <u>BARC Modernization</u> <u>of Facilities</u>	1988 Modernization	5,750,000	Ongoing Projects: 1992 Funds:----- Construction: -- Upgrade Waste Water Treatment Facility Phase 2 (BARC-East) scheduled for completion in the Second Quarter of FY 1994.
	1989 Modernization	6,100,000	
	1990 Modernization	9,860,000	
	1991 Modernization	15,999,792	
	1992 Modernization	16,000,000	
	1993 Modernization	13,547,000	
	1994 Modernization	19,700,000**	
	Total	<u>86,956,792</u>	

**Appropriated under USDA
Rental Payments Account

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
BARC Modernization of Facilities (continued)			-- Plant Science Facility Completion of construction of new facility is scheduled in the First Quarter of FY 1995.
			-- Range 2 Greenhouse Modernization Phase 1 of construction is scheduled for completion in the Second Quarter of FY 1994.
			-- Dairy Research Facility Scheduled for completion in the Second Quarter of FY 1994.
			<u>1993 Funds:</u>
			<u>Design:</u>
			-- (Study) Animal Office/Laboratory Consolidation including APU using cluster concept awarded in the Fourth Quarter of FY 1993.
			-- Controlled Environmental Facility Awarded in the Fourth Quarter of FY 1993.
			-- Upgrade BARC-West electrical system Awarded in the Third Quarter of FY 1993.
			<u>Construction:</u>
			-- Waste Water Treatment Facility at BARC-West Awarded in the Fourth Quarter of FY 1993.

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
BARC Modernization of Facilities (continued)			<u>Planned Projects:</u>
			<u>1994 Funds:</u>
			Design:
			-- Building 004 Modernization Scheduled for award in the Fourth Quarter of FY 1994.
			-- Consolidated Poultry and Livestock Facility Scheduled for award in the Fourth Quarter of FY 1994.
			Construction:
			-- Building 001 Modernization Scheduled for award in the Second Quarter of FY 1994.
			-- Electrical System Upgrade (BARC-West) Scheduled for award in the Third Quarter of FY 1994.
			-- Water System Upgrade Scheduled for award in the Fourth Quarter of FY 1994.
Michigan, East Lansing Regional Poultry Research Center	1992 Planning	\$250,000	Pre-design contract for the Laboratory/Office modifications /addition is scheduled for completion in the Second Quarter of FY 1994. Completion of pre-design contract for experimental and research farms anticipated in the Third Quarter of FY 1994.
	1993 Planning	212,000	
	Total	462,000	
Minnesota, Morris Soil and Water Laboratory	1991 Planning	299,996	Design of the facility was completed in the First Quarter of FY 1994. Construction of Phase I is scheduled for award in the Third Quarter of FY 1994.
	1992 Construction	825,000	
	Total	1,124,996	

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
Modernization of Facilities	1993 Design and Construction 1994 Construction Total	\$2,540,000 1,475,000 <u>4,015,000</u>	The construction of Building 101 Chiller Replacement is scheduled for completion in the Third Quarter of FY 1994. The FY 1994 appropriation will be used for construction of the Waste Water Treatment Plant which is scheduled for award in the Third Quarter of FY 1994.
North Dakota, Fargo Plant Science Greenhouse Complex, North Dakota State University	1991 Planning and Construction	424,995	Construction completion is scheduled in the Second Quarter of FY 1994.
Ohio, Lucas County Demonstration Greenhouse	1992 Planning and Construction 1993 Construction 1994 Construction Total	187,000C/ 158,000C/ 200,000C/ <u>545,000</u>	Environmental Impact study was completed in the First Quarter of FY 1994 with construction of the greenhouse scheduled for completion in the Third Quarter of FY 1994.
Oklahoma, Woodward Greenhouse for the Southern Plains Range Research Station	1992 Planning and Construction 1993 Design/ Construction Total	173,000 146,000 <u>319,000</u>	Construction of the greenhouse is complete. FY 1993 appropriated funds will be utilized for design and construction of a headhouse. A construction contract for the headhouse was awarded in the First Quarter of FY 1994 with completion anticipated in the Fourth Quarter of FY 1994.
Oregon, Corvallis Northwest Small Fruit Center	1990 Feasibility Study 1991 Planning 1992 Construction Total	50,000 174,998 1,900,000 <u>2,124,998</u>	Design of the new facility is complete. A construction contract was awarded in the Fourth Quarter of FY 1993 with completion anticipated in the First Quarter of FY 1995.

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
<u>South Carolina, Charleston</u> <u>U.S. Vegetable</u> <u>Laboratory</u>	1988 Feasibility	\$50,000	Design for Phase 1 of the facility is complete. Construction is on hold until the project is fully funded.
	1990 Planning and Construction	1,135,000	
	1994 Construction	909,000	
	Total	2,094,000	
<u>Texas, Lubbock</u> <u>Plant Stress and</u> <u>Water Conservation</u> <u>Laboratory</u>	1978 Feasibility	100,000	Construction of Phase 1-Headhouse/Greenhouse is complete. Design for Phase 2-Main Laboratory/Office Building is also complete. Construction of Phase 2 is on hold until the project is fully funded.
	1979 Planning	800,000	
	1984 Planning	500,000	
	1990 Construction	500,000	
	1991 Planning	599,992	
	1992 Construction	1,300,000	
	1993 Construction	1,101,000	
<u>Texas, Weslaco</u> <u>ANS Bee Laboratory</u>	1994 Construction	551,000	A construction contract was awarded in the Third Quarter of FY 1992 and is scheduled for completion in the Second Quarter of FY 1994.
	Total	5,451,992	
	1990 Planning	340,000	
	1991 Construction	1,699,978	
<u>Subtropical Agricultural</u> <u>Research Laboratory</u> <u>Modernization</u>	1992 Construction	1,700,000	Planning and design contract is scheduled to be awarded in the Third Quarter of FY 1994.
	Total	3,739,978	
	1994 Planning	1,400,000	
<u>Washington, Yakima</u> <u>U.S. Fruit and</u> <u>Vegetable Laboratory</u>	1988 Planning	1,000,000	Design of facility is complete. Construction contract is scheduled for award in the Second Quarter of FY 1994 with completion anticipated in the Second Quarter of FY 1996.
	1989 Construction	900,000	
	1990 Construction	1,000,000	
	1991 Construction	5,049,934	
	1992 Construction	5,050,000	
	Total	12,999,934	

Status of Construction Projects as of January 1994 (con't.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Amount of Funds Provided</u>	<u>Description</u>
Wisconsin, Madison Greenhouse for the Cereal Crops Research Unit, Barley and Malt Laboratory	1992 Planning and Construction 1993 Construction Total	\$175,000 148,000 323,000	Completion of pre-design contract is anticipated in the Second Quarter of FY 1994. Design contract award is anticipated in the Fourth Quarter of FY 1994.
ARS Facilities, Miscellaneous Parlier, CA Orlando, FL Montpellier, France	1993 Relocation	1,270,000	The following projects will be undertaken in FY 1994: (1) Pre-design of the new laboratory at Parlier, CA, which is scheduled for award in the Second Quarter of FY 1994; (2) design contract for the laboratory in Montpellier, France, which was awarded in the First Quarter of FY 1994, with completion scheduled in the Second Quarter of FY 1995; (3) pre-design award for the new site of the Orlando laboratory which is scheduled in the Third Quarter of FY 1994.

Footnotes:

- a/ Appropriated to ARS and transferred to CSRS.
b/ Appropriated to CSRS.
c/ Grant Award.

AGRICULTURAL RESEARCH SERVICE

Passenger Motor Vehicles

The passenger motor vehicles of Agricultural Research Service (ARS) are used almost exclusively by professional research investigators and technical personnel. In this type of work a high degree of mobility is required. In the course of their daily work, research personnel may need to travel to individual farms, ranches, commercial firms, State agricultural experiment stations, etc.

It is the policy of ARS to pool the use of motor vehicles for different activities in order to keep the number of vehicles to a minimum and reduce overall costs of operation and maintenance. Monthly vehicle operation reports are required and periodic surveys are made to determine the extent to which vehicles are being used and their condition.

Replacement of passenger motor vehicles.

It is proposed to replace 46 of 461 vehicles currently in operation. These vehicles are assigned to ARS locations and are used in connection with research studies and technical assistance. Vehicle replacement is based on funding priority, program management, mileage, and vehicle age.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1993.

<u>Age-Year Model</u>	<u>Number of Vehicles*</u>	<u>Percent of Total</u>	<u>Lifetime Mileage</u> (thousands)	<u>Number of Vehicles</u>	<u>Percent of Total</u>
1988-5	373	81	100 and above	32	7
1989-4	14	3	80-100	69	15
1990-3	18	4	60-80	111	24
1991-2	18	4	40-60	106	23
1992-1	14	3	20-40	88	19
1993	24	5	Under 20	55	12
Total	461	100		461	100

* Includes six vehicles used in foreign countries.

Aircraft

The Agency currently maintains a fleet of seven aircraft, located at College Station, Texas, and Weslaco, Texas. These specially modified and equipped research aircraft are used in pest control airborne insect migration, infrared and color photography, and evaluating effects of weather on agriculture.

THURSDAY, MARCH 3, 1994.

COOPERATIVE STATE RESEARCH SERVICE

WITNESSES

R. DEAN PLOWMAN, ACTING ASSISTANT SECRETARY, SCIENCE AND EDUCATION

JOHN PATRICK JORDAN, ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE

WILLIAM D. CARLSON, ASSOCIATE ADMINISTRATOR, OFFICE OF GRANTS AND PROGRAM SYSTEMS (CSRS)

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

OPENING REMARKS

Mr. DURBIN. This meeting of the Appropriations Subcommittee will be called to order, and this morning we're happy to have representatives from the Cooperative State Research Service.

Dean Plowman, who joined us yesterday, thank you for coming back, Pat Jordan, the Administrator, William Carlson, the Associate Administrator, and Steve Dewhurst.

Steve, glad to have you again.

Dean Plowman, Pat Jordan, we have your statements for the record, and we would appreciate your comments.

Dr. PLOWMAN. Good morning, Mr. Chairman. It's a pleasure to visit with you and the Committee again today. Yesterday we reviewed our in-house research program with the Agricultural Research Service, and the other very important component is our partnership program with the State agricultural experiment stations.

It is these two programs together, the in-house program and our partnership program that make up our very unique and productive agricultural research structure and today Dr. Jordan, the Administrator of CSRS, is here with his staff, and will discuss that program and any questions that the Committee might have.

Mr. DURBIN. Thank you. Dr. Jordan.

STATEMENT OF THE ADMINISTRATOR

Dr. JORDAN. Thank you, Mr. Chairman. It's always a pleasure to be with you, and if I could just make a couple highlight comments.

You are quite correct. As Dr. Plowman has already pointed out, in the United States our agricultural system is unique in that it puts together both a Federal laboratory system and a State university laboratory system that together have brought us international fame.

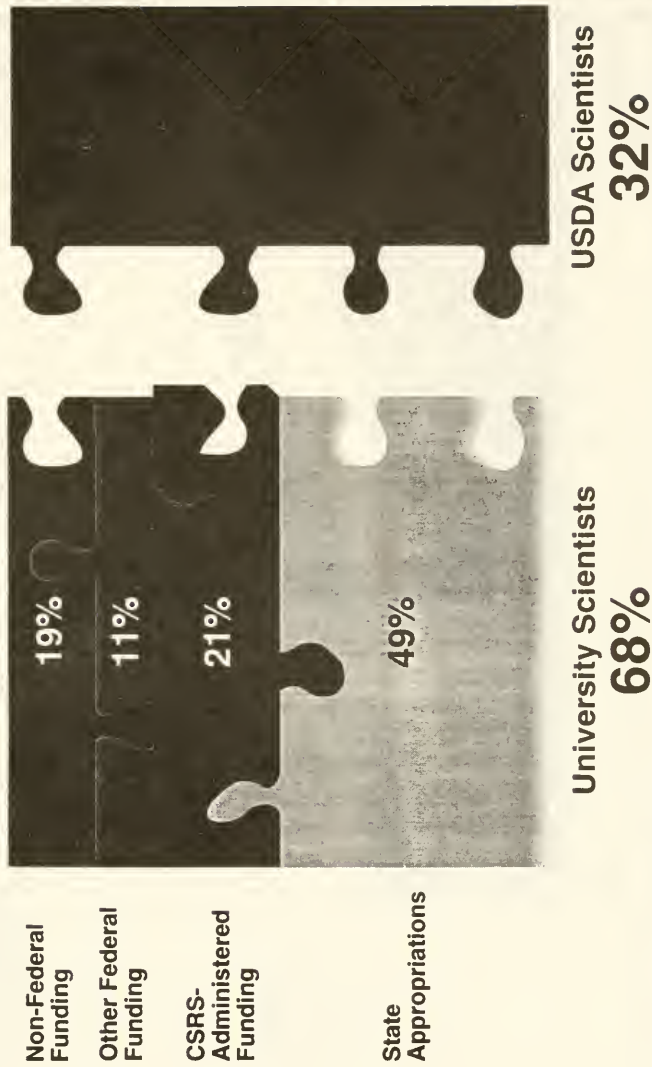
Knowledge about agriculture has been derived and put into the hands of the most capable and knowledgeable farmers and ranch-

ers in the world and translated into real action. That's really been the secret to it.

Part of the rest of the secret to it, Mr. Chairman, is the fact that the States themselves put in about half the money that the universities use in this program. We put in about one-fifth of it, and the remainder of it comes from other non-federal sources and other Federal laboratories of the Federal grant programs.

[The information follows:]

Who Does Agricultural Research?

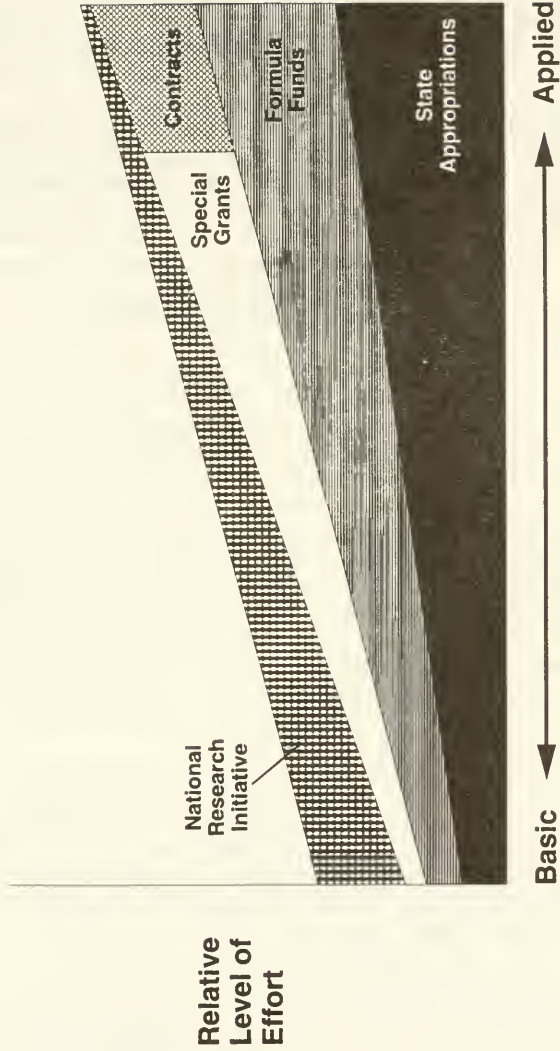


Dr. JORDAN. But the real magic of this thing is the fitting together of the Federal laboratories of the university system, and it's the planning for and the execution of that that is critically important.

For us in CSRS, we talk about an investment portfolio, and we would look at our budget much like you would a family of mutual funds, in a sense. Each one has a specific focus, and put together, they make a total greater than the sum of its parts.

[The information follows:]

Relationship of Research Resources in the Land Grant System



Dr. JORDAN. Certainly some of those dimensions are more at the fundamental end of the spectrum. Others that are applied even out and, translated into practical use so far as commercialization is concerned. We have State appropriations. We have partnership funding delivered in the formula format. We have the National Research Initiative which has as its duty, the fact that it was able to pull into this problem area.

Scientists from any kind of organization—Federal laboratories, land-grant laboratories, non-land-grant laboratories, private laboratories, all kinds of institutions—the Special Research Grants fit in because Congress and the Administration focus on particular issues and bring them to rapid fruition, and we even have some contract money from industry that assists in this overall portfolio.

ACADEMIC PROGRAMS

One of the things that happens as a result of all of this is that we also educate a large number of students. We really provide that basis for the leadership, not only in science, but also in terms of the agricultural enterprise overall through the academic programs, and Congress has been a very, very important part of stimulating that.

You've allowed me in earlier years to talk about the National Graduate Fellowship Grants Program and the fact that it brings to us an entirely different kind of student—highly motivated and extremely well-talented to work on agricultural problems.

We've also talked before about the Challenge Grants Program. This is another place where the leveraging factor shows up. The Challenge Grants Program is appropriated at \$1.5 million and is used in terms of upgrading curricula and equipment and so on at institutions, and these funds are matched dollar-for-dollar by industry, at least dollar-for-dollar.

You've also allowed me in prior years to talk just a little bit about the 1890 Capacity Building Grants Program which serves as the crux of the department's initiative to advance the teaching and research capacity of the 1890 institutions and Tuskegee University.

That, too, has an enormous leveraging factor. That \$10.55 million, Mr. Chairman, in the history of that program, has never been matched with less than 70 percent of the Federal funds, and in some years 100 percent or a little more. So you are really talking about an impact of \$20 million.

In the current fiscal year, resources have been provided to start the new Higher Education Multicultural Scholars Program which will allow us to fund four years of undergraduate scholarships for 40 minority students. The beauty of this is that it also has a leveraging factor.

We provide enough funds for about 75 percent of all the costs associated with putting that student through college. The institution agrees to provide 25 percent of it, so that works out very well too.

The secret of it, in my opinion, Mr. Chairman, is the cooperative planning not only within the university system, but across the Federal laboratories and the university system.

I've put summaries in your packet of two documents. The first is the Dynamics of the Research Investment. That is, what do we

have going now, and what's it doing, and what kind of impact is it yielding?

The second has to do with the four-year upgrade of the strategic plan for this system. I have provided summary documents for you, sir, and I have also had the full documents delivered to each of your offices.

Other years I've been allowed to talk a little bit about accomplishments. I have provided those samples as well, and some of them that I will just touch base quickly on. One example from the University of California focuses on food safety, another one from the University of Illinois on water quality, and that's the kind of communication mechanism that we use so thoroughly.

Mr. Chairman, that concludes my summary comments.

[CLERK'S NOTE.—The Administrator's prepared statement appears on pages 500 through 515. The Explanatory Notes appear on pages 516 through 619.]

TOBACCO RESEARCH

Mr. DURBIN. Thank you very much. Let me ask a few questions if I might. There was a discussion yesterday with the Agricultural Research Service about the future of tobacco research in the U.S. Department of Agriculture.

What are your plans in terms of tobacco research programs?

Dr. JORDAN. We have no program planned for tobacco in CSRS. It is possible, Mr. Chairman, and in fact I would have to check on this, that it is likely that a certain state like North Carolina may in fact have some of its Hatch money in tobacco.

I would have to run the trap line on that for you.

[The information follows:]

TOBACCO RESEARCH

Currently, CSRS does not have a program planned for tobacco research. However, tobacco research is being supported with Hatch Act funds in a number of states including Connecticut, Kentucky, North Carolina and Tennessee. Due to the discretionary nature of the Hatch Act, amounts allocated to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility allows the State institutions to continue tobacco research if they consider it a high priority. In addition, the National Research Initiative Competitive Grants Program supports tobacco research, primarily as a means to determine fundamental mechanisms of plant genetics and physiology since tobacco serves as an excellent model system.

Mr. DURBIN. Please identify for the record the amount of Hatch Act and other funds that are being used in support of tobacco research during fiscal year 1994?

[The information follows:]

Cooperative State Research Service—Tobacco Research

[In thousands of dollars, fiscal year 1994]

<i>Program</i>	<i>Estimate</i>
Hatch Act	\$961
Special Research Grants	33
National Research Initiative	2,328
Total	3,322

Mr. DURBIN. Have you issued any directives with respect to the use of funds in fiscal year 1995?

Dr. JORDAN. No directives have been issued for tobacco research in fiscal year 1995. Due to the discretionary nature of the Hatch Act, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility allows the State institutions to continue tobacco research if they consider it a high priority. The National Research Initiative Competitive Grants Program supports tobacco research primarily as a means to determine fundamental mechanisms of plant genetics and physiology since tobacco serves as an excellent model system.

MORRILL-NELSON GRANTS

Mr. DURBIN. I've been told that in 1907, someone by the name of Nelson suggested that we would start sending \$50,000 to each state, each year for land-grant institutions.

Some 87 years later, I think it may be time to review that. Tell me what that money is used for, and whether you think there might be a better way to spend it?

Dr. JORDAN. Basically, it's used for the academic programs in the agricultural disciplines—laboratory support, perhaps teaching materials of one sort or another. It's a very minor component, there's no question about it. If you were to ask us, are there better ways to spend it, I suspect putting it in a specific targeted education program like the Challenge Grants or the National Needs Fellowships or something like that might make a lot of good sense.

Mr. DURBIN. How much goes to 1890 institutions?

Dr. JORDAN. I would have to check on that, sir. Each state gets about \$50,000. In some states, it is split about evenly in states with 1890 institutions. In others, it may not be exactly even.

[The information follows:]

MORRILL-NELSON GRANTS

In fiscal year 1992, the last year for which data are available, all of the 16 1890 land-grant institutions received Morrill-Nelson funds, but Tuskegee University did not. Of the \$800,000 available to the 16 states that have 1890 institutions, \$218,839.30 or 27 percent were distributed to 1890 institutions in 1992. Florida and South Carolina direct 50 percent of their Morrill-Nelson funds to the 1890 institutions in their respective states.

REPORTS ON RESEARCH GRANTS

Mr. DURBIN. This committee, a few years ago, suggested that we needed a monthly report summarizing research objectives on competitive grants that you had awarded.

Can you give me an idea of what is involved in your preparation of that report?

Dr. JORDAN. I would be glad to. If I may call upon my colleague, Dr. Carlson, to flesh that out a bit.

As it turns out, sir, Congress put in the requirement. I wouldn't change it even if it was stopped because it's so important to us to know exactly where we are in our agenda.

Bill?

Dr. CARLSON. The monthly report is primarily the National Research Initiative, and is a summary of grants that are awarded each month. We try to provide a summary that is not just sci-

entific, but a summary that has meaning and understanding for everyone. We feel it is a very good tool to tell you what is going on.

Dr. JORDAN. We try to write those reports in non-technical terms so that they are easily understood.

Mr. DURBIN. Is a monthly report advisable, or could it be done less frequently and still serve its purpose?

Dr. JORDAN. It probably could. In fact, at the time that we're issuing them on a monthly basis, such as in the late spring and early summer, we're going a mile a minute just trying to get the grants out. So it would be helpful, sir, to have it produced on quarterly basis or something like that.

Mr. DURBIN. Let's work together to try to eliminate some of those reports and paperwork, and still serve the purpose of making sure that the grants are being managed well.

OVERHEAD RATES

Now, our committee's limited overhead rate on competitive grants to 14 percent, and that's been controversial. Some universities tell us that isn't nearly enough. Can you tell me what the impact that this limitation has been on the applications received?

Dr. JORDAN. It's had relatively minor impact, Mr. Chairman. There are a few institutions that refuse to submit proposals to us, but by and large, they are not what you would call mainline agricultural research-type institutions.

The biggest problem area is in the Small Business Innovation Research Program in which we have some small industries who cannot absorb the low overhead costs because their real costs are higher than that, and so more than academic institutions, we find small businesses that sometimes cannot make it under those conditions.

But we have, sir, every year, maybe two or three grants turned down after they have been awarded, and they say well, we've studied it again and decided that we can't afford it.

Mr. DURBIN. Are you able to estimate how much additional research we have funded over the last five years as a result of the limit on overhead rates?

Dr. JORDAN. It is difficult to determine with accuracy the additional funds made available for research resulting from the limits on overhead rates. The indirect cost rate is separately negotiated for each institution by the cognizant Federal agency, and thus the rates vary from institution to institution. Assuming that the average overhead rate using accepted methods to calculate overhead by other government agencies would be equivalent to around 25 percent of direct costs, an increase in dollars going to research would be around 10 percent a year. Considering the National Research Initiative and the other competitively awarded Federal grants this would be about \$45 million over the last five years. On the other hand many universities are requiring departments and/or colleges to pay the true overhead costs out of their state funded research. Thus, the net gain in agriculture research will be much less than the above figure.

Mr. DURBIN. The President has announced a plan to limit overhead rates on research. Have you been advised as to what rate will be proposed?

Dr. JORDAN. We have not been advised as to the proposed overhead rate.

FISCAL YEAR 1995 BUDGET REQUEST

Mr. DURBIN. Please provide for the record the fiscal year 1995 budget funding level, by program, requested by the Cooperative State Research Service to the Secretary, the level requested by the Secretary to OMB, and the final OMB allowance. Please provide this information for each of the categories reflected in the summary table on page 456 of last year's hearing.

[The information follows:]

UNITED STATES DEPARTMENT OF AGRICULTURE
 COOPERATIVE STATE RESEARCH SERVICE
 FY 1995 Funding History
 (Dollars in Thousands)

	FY 1994 Appropriation Act	FY 1994 Revised Approp. Act	FY 1995 Agency Estimate	FY 1995 Department Estimate	FY 1995 Budget Estimate
Hatch Act	171,304	171,304	178,034	171,304	171,304
McIntire-Stennis Cooperative Forestry ..	20,809	20,809	43,546	20,809	20,809
Evans-Allen Program	28,157	28,157	28,901	28,157	28,157
Animal Health & Disease, Sec. 1433	5,551	5,551	5,695	5,551	5,551
Critical Agric. Materials Act of 1984 ..	500	500	-	-	-
Rangeland Research Grants	475	475	502	475	475
Aquaculture Centers	4,000	4,000	4,220	4,000	4,300
Sustainable Agriculture	7,400	7,400	7,925	6,925	6,625
Special Research Grants:					
Animal genome mapping	-	-	3,000	-	-
Econ/soc consequences of agriculture ..	-	-	3,000	-	-
Energy biomass/biofuels	500	470	1,000	500	-
Global change	1,250	1,175	5,200	3,000	3,000
Integrated pest mgt. & biological control	3,228	3,034	10,000	7,000	7,000
Minor use animal drugs	650	611	650	650	650
National Biological Impact Assessment Program	300	282	300	300	300
Pesticide clearance (IR-4)	6,750	6,345	10,000	10,000	10,000
Pesticide impact assessment	1,558	1,474	1,968	1,968	2,968
Rapid Response to Crisis Issues	-	-	4,000	-	-
Rural development centers	500	470	500	500	500
Targeted issues in food safety and animal well-being	-	-	3,000	-	-
Tropical and subtropical research	3,320	3,121	3,320	-	-
Water quality	4,500	4,230	9,000	4,500	4,500
All other	50,351	47,330	-	-	-
Total, Special Research Grants	72,917	68,542	55,938	30,218	29,718
Supplemental and Alternative Crops:					
Crambe/winter rapeseed	500	500	-	-	-
Guayule research	668	665	-	-	-
Canola research	500	500	-	-	-
Hesperaloe research	150	150	-	-	-
Advanced materials	-	-	5,000	1,818	1,818
Total, Supplemental & Altern. Crops ...	1,818	1,818	5,000	1,818	1,818
National Research Initiative Competitive Grants Program (NRI):					
NRI-Natural resources & the environment	23,750	22,325	46,000	28,000	27,000
NRI-Nutrition, food safety, and health	8,000	7,520	21,000	13,000	11,000
NRI-Plants	43,900	41,266	67,840	55,000	47,000
NRI-Animals	25,000	23,500	45,000	33,000	29,500
NRI-Processing for adding value or developing new products	7,500	7,650	20,000	13,000	9,000
NRI-Markets, trade and rural development	4,000	3,760	9,000	8,000	6,500
Total, National Research Initiative ...	112,150	105,421	208,840	150,000	130,000

	FY 1994 Appropriation Act	FY 1994 Revised Approp. Act	FY 1995 Agency Estimate	FY 1995 Department Estimate	FY 1995 Budget Estimate
Federal Administration (direct appro.):					
Gulf Coast shrimp aquaculture, HI & MS	3,500	3,290	- -	- -	- -
Curriculum development and strengthening, Mississippi Valley State Univ.	668	628	- -	- -	- -
Center for Agricultural & Rural Development, Iowa State University	750	705	- -	- -	- -
1690 Capacity Building Grants	10,550	9,917	11,830	10,550	10,550
Water Quality, Illinois & N. Dakota ..	1,250	1,175	- -	- -	- -
Geographic info. system pilot program.	1,075	1,011	- -	- -	- -
Ag in the Classroom	208	196	- -	- -	- -
Office of Agricultural Biotechnology ..	400	376	650	400	400
Peer Panels	260	244	650	500	500
Office of Grants and Program Systems ..	334	314	108	108	108
Pay costs	550	517	1,096 a/	729 a/	675
Center for North American Studies	100	94	- -	- -	- -
Vocational curriculum, aquaculture educ.	500	470	- -	- -	- -
Herd management, TN	613	576	- -	- -	- -
Altern. fuels, ND	250	235	- -	- -	- -
PM-10 Study, CA and WA	1,000	960	- -	- -	- -
Agric. development in American Pacific	647	606	- -	- -	- -
Administrative Overhead	- -	- -	- -	(48)	(48)
Staff year reduction	- -	- -	- -	(294)	(294)
Total, Federal Administration	22,655	21,296	14,304	11,945	11,891
Higher Education:					
Graduate Fellowships (Pre-docs.)	3,500	3,500	5,801	3,500	3,500
Competitive Institution Challenge Grants	1,500	1,500	5,500	1,500	1,500
Minority Scholars Program	1,000	1,000	3,000	1,000	1,000
Morrill-Nelson	2,850	2,850	2,850	2,850	2,850
Hispanic Education Partnership Grants	- -	- -	5,000	- -	- -
AGSAT	- -	- -	- -	- -	- -
1690 Center - Public Policy Academy ..	- -	- -	600	- -	- -
Total, Higher Education	8,850	8,850	22,751	8,850	8,850
Total, CSRS	456,586	444,123	575,558	441,952	421,398
Buildings and Facilities	56,874	53,977	40,568	- -	- -
TOTAL	513,410	498,100	616,126	441,952	421,398

a/ Includes previous years and new pay costs.

BIOTECHNOLOGY RISK ASSESSMENT

Mr. DURBIN. Section 1668 of the Farm Bill requires that one percent of the biotech research funds shall be set aside for risk assessment. Please provide a table for the record listing all USDA biotech research funds, by agency, for fiscal years 1993 and 1994.

[The information follows:]

U.S. DEPARTMENT OF AGRICULTURE—FUNDS AVAILABLE FOR BIOTECHNOLOGY RESEARCH

[Dollars in thousands]

Agency	1993 actual	1994 current estimate	1995 budget
Agricultural Research Service	\$91,540	\$89,310	\$92,570
Cooperative State Research Service	71,294	72,389	67,223
Forest Service	8,500	8,500	8,661
Total, Biotechnology Research	171,334	170,199	168,454

Mr. DURBIN. Please provide a table for the record listing all USDA biotech risk assessment funds, by agency, for fiscal years 1993 and 1994.

[The information follows:]

BIOTECHNOLOGY RISK ASSESSMENT FUNDING BY USDA AGENCY FOR FISCAL YEARS 1993 AND 1994

[In thousands of dollars]

AGENCY	Fiscal year—	
	1993	1994
Cooperative State Research Service	\$725,460	\$712,941
Agricultural Research Service	905,900	941,400
Forest Service	62,000	85,000
Total	1,693,360	1,739,341

SPECIAL GRANTS

Mr. DURBIN. For fiscal year 1993, the budget request for special grants was \$28,918,000. For fiscal year 1994, the request totalled \$34,418,000 and for fiscal year 1995 you are requesting \$29,718,000. Would you please provide for the record a table showing your request for the last three fiscal years, by type of grant?

[The information follows.]

SPECIAL RESEARCH GRANTS FISCAL YEARS 1993, 1994, AND 1995 BUDGET REQUESTS

[Dollars in thousands]

Project	Fiscal year—		
	1993	1994	1995
Energy Biomass/Biofuels	--	\$1,000	--
Global Change	\$4,000	3,000	\$3,000
Integrated Pest Management/Biological Control	5,000	7,000	7,000
Minor use animal drugs	650	650	650
National Biological Impact Assessment Program	300	300	300
Pesticide Clearance	7,000	10,000	10,800
Pesticide Impact Assessment	2,968	2,968	2,968
Rural Development Centers	--	500	500

SPECIAL RESEARCH GRANTS FISCAL YEARS 1993, 1994, AND 1995 BUDGET REQUESTS—
Continued

[Dollars in thousands]

Project	Fiscal year—		
	1993	1994	1995
Water Quality	9,000	9,000	4,500
Total	28,918	34,418	29,718

PLANT GENOME MAPPING

Mr. DURBIN. For each of the following commodities what is the status of their genome mapping: corn, wheat, soybeans, cotton, and peanuts?

Dr. JORDAN. The availability of molecular genomic maps for the mentioned commodities has progressed rapidly over the past few years, largely due to the research efforts supported by the USDA. The USDA Plant Genome Program has focused on research to identify DNA markers that are used as probes to identify genes or traits of agricultural importance. DNA marker technology and information will ultimately facilitate plant breeding and crop improvement efforts. We will list for the record the status of genome mapping for the mentioned commodities.

[The information follows:]

Crop	Approximate number of mapped—	
	DNA markers	Genes
Corn	1500-3000+	700
Wheat	1000-1500+	300
Soybeans	1000-1500+	45
Cotton	400-600+	(1)
Peanuts	300-500+	(1)

¹ Few.

Current estimates indicate that there are 25,000 to 100,000 genes in agronomic plants which makes locating genes of economic interest very challenging. Map information and other useful data on the above mentioned species and many others, is maintained electronically in the Plant Genome Database at the USDA National Agricultural Library for use by the research community.

Mr. DURBIN. Please indicate for the record. Who has participated in the mapping?

[The information follows:]

The research is being carried out at the following locations:

CORN

Auburn University, Alabama.
Cornell University, New York.
DNA Plant Technology, California.
Duquesne University, Pennsylvania.
Illinois State University, Illinois.
Iowa State University, Iowa.
Kansas State University, Kansas.
Massachusetts General Hospital, Massachusetts.
Michigan State University, Michigan.
North Carolina State University, North Carolina.
Purdue University, Indiana.

University of Missouri, Missouri.
 University of Minnesota, Minnesota.
 University of California-Riverside, California.
 University of Idaho, Idaho.
 University of California-San Diego, California.
 University of Texas, Texas.
 University of Utah, Utah.
 University of Florida, Florida.
 USDA-ARS, North Carolina.
 University of Wisconsin, Wisconsin.

COTTON

New Mexico State University, New Mexico.
 Texas A&M University, Texas.

PEANUT

Clemson University, South Carolina.
 University of Georgia, Georgia.

SOYBEAN

Indiana University, Indiana.
 New Mexico State University, New Mexico.
 North Dakota State University, North Dakota.
 Northern Arizona University, Arizona.
 Ohio State University, Ohio.
 University of Tennessee, Tennessee.
 University of Illinois, Illinois.
 University of Nebraska, Nebraska.
 USDA/ARS, Beltsville, Maryland.

WHEAT

University of California, Davis, California.
 Kansas State University, Kansas.
 Cornell University, New York.
 Montana State University, Montana.
 University of Nebraska, Nebraska.
 North Dakota State University, North Dakota.

ACCOMPLISHMENTS

Mr. DURBIN. What are some of the recent accomplishments in this area?

Dr. JORDAN. A major accomplishment in plant genome mapping has come from researchers at Cornell University. They have isolated and cloned for the first time a disease-resistance gene that protects some species of tomato from a disease called "bacterial speck." When the resistance gene was transferred to otherwise susceptible tomato plants, the plants became resistant to the pathogen. This research has the potential to speed up plant breeding for disease resistance and thereby help farmers stay ahead of the ever-changing populations of disease causing microorganisms. Scientists at North Carolina State University have analyzed the loblolly pine genome and mapped about 200 genetic markers to the trees' chromosomes as part of a genetic improvement program for loblolly pine. The map was created in only 60 days and is currently the most extensive genetic map on a woody plant, and represents a major accomplishment for a species who many had thought was nearly impossible to delineate. Commercial forestry in the Southeastern United States is a \$49 billion business and is predominantly loblolly pine. The wood is used for manufacturing wood

products. With the genomic map in hand, plant breeders can now greatly accelerate the development of improved loblolly pines by focusing time and resources on the most important parents and the most desirable offspring. In the process of transferring an agriculturally-desirable trait into a crop plant via genetic engineering techniques, a selection—marker—gene must be co-introduced along with the desired gene, in order to detect the genetically modified cells. The presence of a marker gene in a genetically engineered crop increases the uncertainty of consume acceptance and regulatory approval. USDA/ARS scientists have alleviated this concern by developing a method for removing the marker genes before genetically modified crops are planted outdoors. This new technology may speed regulatory approval and consumer acceptance of genetically engineered plants.

COORDINATION

Mr. DURBIN. How is this coordinated with ARS?

Dr. JORDAN. The USDA Plant Genome Research Program was established in 1991 to fund research to identify, characterize and transfer genes that control plant traits important to agriculture and forestry. The program is a cooperative efforts of four USDA agencies; the Agricultural Research Service —ARS—, the National Agricultural Library —NAL—, the Cooperative State Research Service —CSRS—, and the Forest Service —FS. ARS is the lead agency. In cooperation with ARS, the CSRS National Research Initiative Competitive Grants Program —NRICGP— is responsible for administering the competitive grants portion of the program. Investigator initiated, peer-reviewed grants that total about \$12 million have been awarded annually since 1991 to about 70 to 90 plant genome research projects.

IR-4 AND PESTICIDE CLEARANCE

Mr. DURBIN. Please provide for the record a table which shows total USDA funding for IR-4 work for fiscal years 1993, 1994, and 1995.

[The information follows:]

USDA IR-4 Program
[In thousands of dollars]

USDA Agency	Fiscal year—		
	1993	1994	1995 Proposed
Cooperative State Research Service			
Hatch Act	\$482	\$490	\$490
Special Research Grants Pesticide Clearance	3,964	6,345	10,800
Total, CSRS	4,446	6,835	11,290
Agricultural Research Service	2,142	2,142	2,142
Total, USDA	6,588	8,977	13,432

Mr. DURBIN. How many registrations were completed in 1993, and what is the goal for fiscal year 1994?

Dr. JORDAN. The IR-4 Project was responsible for 66 pest control product clearances for minor food crops in 1993. These include petitions for tolerances, exemptions, registrations, and label amendments. IR-4 also was responsible for 37 new pesticide registrations for ornamental crops. IR-4 submitted 2 regulatory documents to EPA for biorational pest control agents and funded 3 biorational research projects.

The goal for fiscal year 1994 is 430 food use completions and 380 ornamental completions as well as biorational completions.

Mr. DURBIN. What is the current backlog of pesticide clearance requests?

Dr. JORDAN. Currently, there is a backlog of 1,342 pesticide clearance requests on minor food crops, and a backlog of 711 clearance requests on ornamental crops.

Mr. DURBIN. What financial assistance do you receive from industry?

Dr. JORDAN. In 1993, IR-4 received almost \$500,000 in support from industry.

MINOR USE ANIMAL DRUGS

Mr. DURBIN. What is the backlog on minor use animal drugs and how many were registered in 1993?

Dr. JORDAN. Since the Minor Use Animal Drug Program was began, 250 drug requests have been submitted to the Minor Use Animal Drug Program for clearance. Working in conjunction with many universities, the U.S. Department of Interior Fish and Wildlife Service, the Agricultural Research Service, and numerous pharmaceutical companies, 46 research projects on 16 different drugs have been initiated. Twenty public master files, which involve 12 different animal species, have been published in the Federal Register providing clearance for drug use in minor species. One new drug was approved in 1993. Ten additional public master files have been completed by the regional coordinators and investigators and are being reviewed by the Food and Drug Administration—FDA.

Of the remaining 204 requests, approximately 75 percent are potential projects for the Minor Use Animal Drug Program. Limiting factors include the lack of a pharmaceutical company to sponsor the research, the unavailability of research investigators, the fact that the drug is not approved in a major species, or insufficient funds for research. In addition, the scope of the program has expanded due to increased emphasis on aquatic species and the recent classification of veal and sheep as minor species. The importance of environmental assessment, residue withdrawals and occupational safety have increasingly been given more attention during the approval process to help assure consumer protection.

Mr. DURBIN. What is the goal for fiscal years 1994 and 1995?

Dr. JORDAN. Currently there are ten public master files being reviewed by the FDA. The regional coordinators and investigators expect to complete the research for several additional animal drugs in the next two years. It is anticipated that four new drugs will be approved in 1994 and 1995.

Mr. DURBIN. What financial assistance do you receive from industry?

Dr. JORDAN. The IR-4 Minor Use Animal Drug Program continues to benefit from the eighteen pharmaceutical companies that have cooperated as sponsors for animal drug research projects for this program. They continue to provide the extension research for clearance for the drugs in a major species, the predominant costs for registration. Industry routinely contributes analytical analysis for the Minor Use Animal Drug Program and in several instances provide direct financial support. In 1993, IR-4 received almost \$500,000 in support from industry.

AFLATOXIN RESEARCH, ILLINOIS

Mr. DURBIN. Please provide a description of the research that has been funded under the Aflatoxin Research, Illinois grant.

Dr. JORDAN. Past work on this problem has involved screening corn germplasm for resistance to aflatoxin production, testing of *Aspergillus flavus*-inhibiting chemicals, identifying fungus-inhibiting enzymes, developing recombinant genetics methods, and tissue culture/plant regeneration studies.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Because aflatoxins are potent carcinogens with other toxic properties, there are potential health risks for humans and farm animals, wherever they may be exposed to toxin-contaminated corn. Although aflatoxin contamination is most serious in the southeastern United States, outbreaks have occurred in the upper midwest.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was the reduction of aflatoxin production in corn. Recent accomplishments include contained evaluation of corn crops for resistance to ear infection by the fungus, and to aflatoxin production. Tissue culture studies were conducted as a basis for a controlled system for evaluation of corn callus and the fungus. Illinois scientists were able to effectively monitor fungus growth in contact with corn callus. Work was continued on development of an effective transformation system for producing corn germplasm with elevated pathogen resistance. Fungicide efficacy studies were discontinued.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1990, \$87,000; fiscal year 1991, \$131,000; fiscal years 1992-1993, \$134,000 per year; and fiscal year 1994, \$126,000. A total of \$612,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$103,483 state appropriations, and \$115,500 miscellaneous in 1991; \$5,470 miscellaneous in 1992; and \$40,269 state appropriations, \$898 product sales, and \$38,777 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the University of Illinois.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that the work may be completed in fiscal year 1995.

AGRIBUSINESS MANAGEMENT, MISSISSIPPI

Mr. DURBIN. Please provide a description of the research that has been funded under the agribusiness management program.

Dr. JORDAN. This grant provides partial support for the operation of the Agribusiness Management Institute. The Institute carries out a program to develop and disseminate management materials to those working in agribusiness professions. CSRS has received the fiscal year 1994 proposal and it is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. There is a long-standing national need to educate American agribusiness professionals on management concepts to improve their competitiveness in the domestic and international markets. This project is designed to develop these concepts and strategies.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to improve the competitiveness of U.S. agriculture by improving the management and leadership skills of professionals in agribusiness.

The grant has been used to acquire information and develop an advanced agribusiness educational program that can be used by institutions of higher education. Research is planned to acquire additional information from the agribusiness industry on other research needs to improve managerial skills and their ability to compete in a global marketplace.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded since 1991 in the amount of \$75,000 per year through 1993 and \$70,000 in 1994. A total of \$295,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$5,996 State appropriations, \$1,076 product sales, \$0 industry, and \$361 miscellaneous for a total of \$7,433 in 1991; \$17,666 State appropriations, \$5,494 product sales, \$10 industry, and \$1,209 miscellaneous for a total of \$24,379 in 1992; \$14,121 State appropriations, \$509 product sales, \$496 industry, and \$2,984 miscellaneous for a total of \$18,110 in 1993. Final determination has not been made for the allocation of non-federal funds for fiscal year 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The work is being carried out at Mississippi State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal researchers anticipate that the work will be completed in 1996.

AGRICULTURAL DIVERSIFICATION AND SPECIALTY CROPS, HAWAII

Mr. DURBIN. Please provide a description of the work that has been funded under the Agricultural Diversification and Specialty Crops grant.

Dr. JORDAN. The objective continues to be high value-added alternatives to sugar and pineapple. One product that is culturally important to Hawaii and possesses considerable economic potential is taro. Researchers have developed a viable taro flour processing technology ready to move from bench-scale to the pilot-scale level. This step is important for establishing large-scale processing parameters which will provide prospective manufacturing partners with the information necessary to make investment decisions. Concurrently, commercial-scale taro tissue culture has supplied a contract farmer with the necessary taro stock to develop and demonstrate large-scale processing. Researchers have applied for a patent on their flour making processes.

Mr. DURBIN. according to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Commercially viable alternatives to sugar and pineapple allow new or replacement employment in distressed areas of Hawaii. New taro flour products offer new nutritious and safe foods for people with allergies.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the original research was to screen potential food and nonfood crops for commercial development in Hawaii. White taro emerged as the most promising new crop with market prospects. Researchers have identified that taro, a tropical root crop, can potentially add to the limited number of foods available to consumers with sensitivities to certain food ingredients. The researchers have developed a way to process the root crop so that it does not need to be cooked before processing, thus leading to cost reductions. Researchers have linked potential processors with potential buyers and have stimulated research and development by the private sector to create a faster transfer of technology. The researchers have also applied for a processing patent to ensure that the majority of benefits from technology development are enjoyed by Americans.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1988 and 1989, \$156,000 per year; fiscal years 1990 through 1993, \$154,000 per year; and fiscal year 1994, \$145,000. A total of \$1,073,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds are not provided for this research. The University of Hawaii provides in-kind support in the form of

laboratory and office facilities, equipment and equipment maintenance and administrative support services: \$866,513 in fiscal year 1991; \$68,503 in fiscal year 1992; \$75,165 in fiscal year 1993 and \$74,663 in fiscal year 1994. In addition, private in-kind support for large scale white taro production and land for a taro flour plant has been secured from C. Brewer and Company.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. Research is being conducted at the University of Hawaii's Institute of Tropical Agriculture and Human Resources.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the taro phase of the project will be completed in 1994. The next phase will entail the same approach, but the focus will be on industrial products derived from agricultural production.

AGRICULTURAL MANAGEMENT SYSTEMS, MASSACHUSETTS

Mr. DURBIN. Please provide a description of the research that has been funded under the agricultural management systems program.

Dr. JORDAN. The Massachusetts Agricultural Experiment Station Agricultural Management Systems Program serves as a New England regional center for the development of alternative agricultural management systems which are sustainable, biologically based and economically viable.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The Center for Agricultural Management Systems focuses on research and extension programs for apples, cranberry, crucifers, potato, strawberry, and sweet corn—commodities which are important to New England and in which Massachusetts already has established a strong research base.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original and current goals are to continue development of research-based strategies for pest management, develop new technologies for pest management that use natural enemies of pests and/or use genetically engineered microorganisms, and improve techniques for pest population monitoring. Currently, numerous lines of investigation are underway. IPM programs conducted in nearly half of Massachusetts commercial apple orchards have resulted in a one-third and one-fifth reduction—(from pre-1978 levels) in the use of insecticides and fungicides respectively. Progress was made in identifying and synthesizing a sex pheromone for *Sparganothis sulfureana*, one of the most challenging cranberry pests. Successful use of this pheromone could aid in the future elimination of environmentally-harmful synthetic pesticides. Management practices in crucifers, directed at enhancing the survival of natural enemies, have resulted in successful establishment and/or buildup of predators and parasites of the cabbage aphid, diamondback moth, and imported cabbageworm. Growers following the IPM program for 2–3 years have reduced the number of pesticides used for cabbage root maggot by 33–50 percent, have in-

creased their use of the biopesticide B.t. from 55 percent to 84 percent, and have reduced losses for disease while reducing fungicide use. IPM techniques have been successful in strawberries for managing major insect pests and diseases in commercial settings, maintaining high quality yield, and saving growers an average of \$55 per acre in pesticide costs. Large scale demonstration of B.t. as a non-toxic alternative for controlling Colorado Potato Beetle again revealed this material to be cost effective and capable of providing adequate control compared to conventional approaches. Eighteen potato fields—126 acres on six farms reduced broad spectrum insecticide use by 73 percent compared to baseline use levels.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. This program began in fiscal year 1991. Appropriations by fiscal year are as follows: 1991—\$275,000, 1992—\$261,000, 1993—\$261,000, 1994—\$245,000. A total of \$1,042,000 has been appropriated for this work.

Mr. DURBIN. What is the source and amount for non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds associated with this project for fiscal year 1994, from the Massachusetts Department of Food and Agriculture, total \$134,000. Similar support was received for fiscal years 1991–1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This work is underway at the Massachusetts Agricultural Experiment Station in the University of Massachusetts, Amherst, Massachusetts.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that the work may be completed in fiscal year 1995.

ALFALFA RESEARCH, KANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Alfalfa Research, Kansas grant.

Dr. JORDAN. This project was designed to improve utilization of alfalfa protein for beef cattle through coordinated research studies of plant breeding, forage management and animal breeding.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The stated need and the primary focus of this research deals with the local Kansas situation. However, the anticipated results from these studies will have application nationally wherever alfalfa is grown and/or used.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was the development of improved cultivars, and production/harvest/storage systems that will result in improved utilization of alfalfa protein by beef cattle. To date the work has focused on experimental evaluation techniques for assessing protein loss and changes in stored alfalfa, the evaluation of genetic control of protein degradability and the

conduct of animal feeding studies to compare alfalfa supplement with grain and low quality forage ration.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and appropriations for fiscal years 1992 and 1993 were \$125,000 per year and \$118,000 in 1994. A total of \$368,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds provided for this grant were as follows: \$152,679 state appropriations, \$12,128 product sales and \$1,128 miscellaneous in fiscal year 1992 and \$215,361 state appropriations, \$28,784 product sales and \$3,154 miscellaneous in fiscal year 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Kansas State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1997.

ALTERNATIVE CROPPING SYSTEMS IN THE SOUTHEAST

Mr. DURBIN. Please provide a description of the research that has been funded under the Alternative Cropping Systems in The Southeast special grant.

Dr. JORDAN. The South Carolina, North Carolina and Georgia Agricultural Experiment Stations have collaborated in a joint research project, to study the economic and biological feasibility of expanded production of horticultural crops in the southeastern United States.

Mr. DURBIN. According to the research proposal, or principal researcher, what is the national, regional or local need for this research.

Dr. JORDAN. The regional need for this research is to evaluate the potential of alternative crops to improve the economic competitiveness of small farms in the tri-state area, and to develop production systems for those that appear to be promising.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this work was to find alternative high value crops that could increase income necessary for the continued survival of the relatively small size farms in the Southeast U.S. The work has evaluated important production management practices, harvest and handling methods and assessed market windows for several horticultural crops including melons, tomatoes, greenbeans and peppers.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1985?

Dr. JORDAN. Work supported by this grant began in fiscal year 1985 and appropriations are as follows: fiscal year 1985, \$300,000; fiscal years 1986-1989, \$285,000 per year; fiscal year 1990, \$281,000; fiscal year 1991, \$277,000; fiscal years 1992-1993,

\$278,000 per year; and fiscal year 1994, \$261,000. The total to date is \$2,815,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$525,053 state appropriations in 1991; \$702,834 state appropriations in 1992, and \$388,148 state appropriations in 1993.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The work is being carried out at the South Carolina, North Carolina, and Georgia State Agricultural Experiment Stations.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate it will be completed?

Dr. JORDAN. The university researchers have estimated that this work would be completed in fiscal year 1995.

ALTERNATIVE CROPS, NORTH DAKOTA

Mr. DURBIN. Please provide a description of the research that has been funded under the Alternative Crops, North Dakota program.

Dr. JORDAN. In this investigation of alternative crops, plant species studied were amaranth, fenugreek, coriander, sesame, camelina, and quinoa. Measurements of yield, industrial products such as squalene and tocotrienols, pectin, starch size and enzymatic activity were measured. Also, preliminary marketing studies on flax seed utilization in human foods were completed. Other university researchers studied anthocyanins from purple-hulled sunflower, enzymatic esterification of pure linoleic acid in supercritical carbon dioxide, conversion of erucic acid to brassylic and pelargonic acids and foam stabilizing effects in waterborne alkyd polymers based on linseed. Amaranth starch was tested for qualities as a sizing material for paper, also model systems of amaranth starch gels were characterized using differential scanning calorimetry, mechanical compression and x-ray diffraction.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional or local need for this research?

Dr. JORDAN. Regionally, the central northern temperate area of the nation is dominated by several monoculture crops e.g. corn, wheat, and soybeans which eventually leads to non-sustainability due to diseases, erosion and complete dependence upon specific market vagaries. North Dakota is a leadership state in the development and breeding of new and alternative crops, e.g. dry edible beans, sunflower, crambe and northern adapted soybeans.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research is to introduce, evaluate and test new crops which will broaden the economic diversity of crops grown in North Dakota. The primary emphasis is to find new crops with non-food uses and create value added products.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Appropriations by fiscal year are as follows: 1990, \$494,000; 1991, \$497,000; 1992, \$700,000; 1993, \$700,000; and 1994, \$658,000. A total of \$3,049,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. In fiscal year 91, \$10,170 was provided by state appropriations. In fiscal year 92, \$29,158, was also provided by state appropriations and self-generated funds. In fiscal year 93, \$30,084, was provided by state appropriations.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is conducted on the campus of North Dakota State University and in the field at the Carrington Research and Extension Center, Carrington, North Dakota.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The breeding and selection of new crops and utilization of such crops in North Dakota is an ongoing process. It began with statehood and the establishment of the North Dakota Agricultural Experiment Station in 1890 and could continue indefinitely.

ALTERNATIVE CROPS FOR ARID LANDS-TEXAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Alternative Crops for Arid Lands-Texas grant.

Dr. JORDAN. This grant is to develop indigenous resources of mesquite and prickly pear cactus for the southwestern United States through a combination of applied research and market development.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this goal?

Dr. JORDAN. The semi-arid regions of the United States that border with Mexico in Texas, New Mexico, Arizona, and California have some of the highest unemployment rates and lowest incomes in the United States. The two most abundant plant species in this region are prickly pear cactus and mesquite. By working with Mexican researchers, this grant will help to stabilize the economic situation of rural poor in Mexico and the United States. The research results are also currently being used in Israel, India, Brazil, Haiti, and Sahelian Africa.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to dramatically improve the economic returns, and year-to-year economic stability in southwestern United States. Accomplishments have been 20-30 percent growth/year in mesquite lumber industry, a new vegetable variety of cactus was released, the National Hardwood Lumber Association approved new international grading rules for mesquite lumber, a high production flooring system was developed and transferred to the private sector, a major collection of 50 cold hardy fruit, forage cactus clones was obtained, and a sustainable system for mesquite management was developed that avoids use of bulldozers and aerial herbicides by creating markets for mesquite products and utilizing mesquite's nitrogen fixing properties.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal 1994?

Dr. JORDAN. Fiscal year 1994 is the first year of funding for this grant and \$94,000 has been appropriated. Similar work has been funded since August 1985.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. In fiscal year 1994, \$43,215 is being provided by the Texas Legislature.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The work is being conducted by Texas A&M University, Kingsville, Texas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that significant but small Texas cactus and mesquite industries will result by fiscal year 1998. Transformation of these small industries into medium industries and transfer of the arid technologies to midwestern and southeastern United States will carry on well into the next century.

ALTERNATIVE MARINE AND FRESHWATER SPECIES, MISSISSIPPI

Mr. DURBIN. Please provide a description of the research that has been funded under the alternative marine and freshwater species grant.

Dr. JORDAN. The research has focused on the culture of hybrid striped bass, prawns, and crawfish. Nutritional requirements and alternative management strategies for these species have been evaluated. Economic models based on these management strategies and species have been refined to assist potential producers in evaluating alternative opportunities in commercial aquaculture. The fiscal year 1993 grant supports research through June 1994. The fiscal year 1994 grant proposal is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The principal researcher indicates that as the aquaculture industry continues to grow it is extremely important to consider alternative species for culture in order to help the industry diversify. Diversification is of benefit to both the producer and consumer of aquaculture products. Research generated from this grant should lead to alternative production systems that can have national, regional and local impact.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to develop and evaluate aquaculture production technologies that would lead to the use of alternative species and management strategies in commercial aquaculture production. Research evaluating stocking rates, nutritional requirements, and methods to reduce stress in hybrid striped bass production systems has led to the development of improved production efficiency in these systems. Recent research indicates that the protein levels in feeds for hybrid striped bass can be reduced without impacting growth rates. The development of alternative management strategies for freshwater prawns has im-

proved production efficiency and the economic viability for this species in pond systems.

Mr. DURBIN. How long has the work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal years 1991-1993 has been \$275,000 per year, and \$258,000 in 1994. A total of \$1,083,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university reports a total of \$276,495 of non-federal funding to support research carried under this program for fiscal years 1991-1993. The primary source of the non-federal funding was from state sources.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. Research is being conducted at Mississippi State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that the specific research outlined in the current proposal will be completed in fiscal year 1995.

ALTERNATIVE PEST CONTROL—ARKANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Alternative Pest Control grant.

Dr. JORDAN. This grant supports a research center which is working to discover and develop methods to utilize and commercialize biological control agents and other alternative practices for control of pests in crops. The program is as follows: collecting, isolating, and identifying candidate biological control agents; evaluating the effectiveness of biological control agents and improved, resistant germplasm in agriculture; developing procedures for formulation and application of biological control agents useful to private sector technology transfer and commercialization; evaluating field performance of implemented alternative controls and strategies; and assessing the environmental impact of implementing alternative pest controls.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The Alternative Pest Control Center at the University of Arkansas is developing and implementing biological control, host plant resistance, and cultural controls in the local agriculture. However, most of the pests being addressed are regional and even national in impact. Technologies developed at the Center are broadly useful throughout the range of specific pests.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this project is to develop pest control technology that provides an alternative to conventional, broad-spectrum, chemical pesticides. The Center has developed and found ways to utilize rice cultivars, green mulches of sunflower plants, tall fescue, fall and spring cover crops to inhibit weeds in

rice, row crops, lawns, and vegetable crops, respectively. They have found that condensed tannin and tannic acid in crop host plants inhibit the activity of viruses that infect caterpillars and this finding will be important to finding other ways to utilize the viruses. They have worked with extension specialists to implement a monitoring system that alerts growers of vegetables and cotton of a fungal epidemic in melon aphids so that they can reliably utilize the natural control and avoid unnecessary pesticide use. They are working with a fungus to control soybean cyst nematode and a non-pathogenic strain in *Fusarium oxysporum* to suppress *Fusarium* wilt in row crops and vegetables. Research in host specificity, genetics, environmental fate, and potential gene exchange involving biological control agents is providing a basis to assure environmental safety of these organisms and products. Integration of reduced herbicide rates with mulches, rotations, ridge tillage, allelopathic cover crops are being demonstrated in commercial agriculture systems for control of weeds.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: Fiscal year 1989, \$1,400,000; fiscal year 1990, \$1,382,000; fiscal year 1991, \$1,391,000; fiscal years 1992 and 1993, \$1,400,000 per year; fiscal year 1994, \$1,316,000. A total of \$5,289,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Arkansas provided \$945,151 in support for the Alternative Pest Control Center from the State appropriations, industry contracts, indirect costs of 30 percent, and other miscellaneous sources during 1991 and 1992. Data for 1993 are not yet available.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the University of Arkansas and in cropping systems in Arkansas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The fiscal year 1994 proposal indicates that the research will be completed in April, 1999.

APPLE PEST CONTROL, CALIFORNIA

Mr. DURBIN. Please provide a description of the research that has been funded under the Apple Pest Control grant.

Dr. JORDAN. This research is a new proposal in fiscal year 1994. The research is a multi-disciplinary team effort to develop transgenic apple plants with pesticidal genes for the management of codling moth. The second thrust of the research is to test a variety of transgenes encoding resistance to nematodes and soil fungi through the transformation of rootstock varieties.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Apple is the most widely grown deciduous fruit in temperate regions of the world with total annual production in the United States of \$2 billion concentrated mostly in Washington,

New York, Michigan and California. One focus of the research is on codling moth, the key insect pest for apple, pear and walnut species. Currently, the industry is dependent upon conventional chemical control for the management of codling moth. This research is designed to provide alternatives to chemical applications for codling moth suppression which is a national priority. The other national issue that this proposal addresses is finding an alternative to methyl bromide fumigation through the development of rootstocks resistant to nematode pests. This is a very serious problem with methyl bromide having an atmospheric ozone depletion potential higher than that of chlorofluorocarbons.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this research is the production of transgenic tree crops expressing a variety of useful genes to manage pest populations. Past research by the team has demonstrated that genes encoding the insecticidal proteins of *Bacillus thuringiensis* can be successfully transferred into apple trees to protect against the codling moth.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$235,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are \$178,849 State Appropriations and \$117,000 from industry for a total of \$295,849 in fiscal year 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the California Agricultural Experiment Station located at Davis, California.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1999.

ANIMAL SCIENCE FOOD SAFETY CONSORTIUM

Mr. DURBIN. Please provide a description of the work that has been funded under the animal science food safety consortium program.

Dr. JORDAN. The research goal is to enhance the safety of red meat and poultry products for human consumption. There are six objectives. One is to develop rapid detection techniques of pathogenic organisms and toxic chemicals for use by the red meat and poultry production-marketing system. Two is to develop a statistical framework from which to develop tolerance levels for these hazardous substances. Three will identify effective interdiction points and develop methods to prevent or reduce substance presence. Four is to develop monitoring techniques and methodologies to detect and estimate the human health risk of these contaminants. Five is to develop technologies to reduce hazards and enhance quality of animal food products to complement the development of Hazard Analysis Critical Control Point programs by USDA,

and six will estimate benefits and costs and risks associated with interdiction alternatives. The consortium's members have submitted fiscal year 1994 proposals to CSRS, and they are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional, or local need for this research?

Dr. JORDAN. A safer food supply will reduce large economic losses—\$4 to \$7 billion a year—as a result of lost productivity and wages and medical treatment of victims. Safer products will also find greater acceptance in global markets and, therefore, will contribute to economic growth.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to develop production and processing techniques that will reduce or eliminate the presence of food borne pathogens and toxic substances from the Nation's red meat and poultry supplies.

The consortium is organized and operated along institutional lines with a coordinator and directors managing the research program. Two committees, advisory and technical which consist of outside representation, provide advice on research planning and expertise on technical matters. The committees recently completed a thorough revision of the 5-year strategic research plan.

Major accomplishments by the University of Arkansas include development, patenting, and further refinements of a fast detection test for the pathogen *Listeria monocytogenes*, use of ozone to decontaminate poultry chill water for recycling, reduction and elimination of various pathogens with chemical washes, methods to lower bacterial counts for reprocessing broilers, and a monoclonal antibody probe for isolating *Pediococcus acidilactici* in fermented meats. The University is conducting 24 projects.

Major accomplishments by Iowa State University include finding that the major source of coliform bacteria contamination occurs during cutting and packaging of pork carcasses; showing that environmental conditions do not affect different pathogens the same, therefore requiring use of different inactivation methods; determining that a number of different pathogenic viruses survive on meat products under typical storage conditions creating a potential human health risk; assessing the impacts of sulfa removal from swine production and determining that consumers are willing to pay more for safer meat products.

Kansas State University has made progress in developing faster pathogen detection methods including development of new enrichment mediums, developing a method to monitor organophosphates and their metabolites in beef muscle, exploring the potential for aerosol contamination of meat in packing houses, and completing promising pilot projects for electronic identification methods for cattle.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$1,400,000; fiscal year 1990, \$1,678,000; fiscal year 1991, \$1,845,000, and fiscal years 1992–

1993, \$1,942,000 per year; fiscal year 1994, \$1,825,000. A total of \$10,632,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$1,313,653 State appropriations, \$2,959 product sales, \$35,600 industry, and \$259,735 miscellaneous for a total of \$1,611,947 in 1991; \$1,270,835 State appropriations, \$10,129 product sales, \$90,505 industry, and \$267,590 miscellaneous for a total of \$1,639,059 in 1992; and \$1,334,680 State appropriations, \$1,365 product sales, \$33,800 industry, and \$356,308 miscellaneous for a total of \$1,726,153 in 1993. Allocations have not been determined by the universities for 1994 non-federal funding.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by a consortium composed of the University of Arkansas at Fayetteville, the University of Arkansas for Medical Sciences at Little Rock, Kansas State University, and Iowa State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The current program of research outlined under the consortium's recently revised strategic research plan should be completed in 1999.

AQUACULTURE RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the aquaculture research grant.

Dr. JORDAN. Included in the program are studies to improve production efficiency through disease and parasite control, integrated aquatic animal health, genetics, breeding, and aquaculture waste management. Research under grants awarded in fiscal year 1993 extends through August 1996. In fiscal year 1994, deadline for submission of competitive proposals is April 18, 1994. In fiscal year 1994, the research funded in this program will address aquaculture waste management. The proposals will be evaluated by a peer panel and final selection of proposals is expected to be completed by July.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, and local need for this research?

Dr. JORDAN. The continued growth and competitive position of the domestic aquaculture industry is directly related to the resources invested in the aquaculture research and technology base. This competitively awarded research grant program has addressed national and regional priorities in aquaculture to support the rapidly expanding domestic aquaculture industry as a form of sustainable aquaculture. As a part of the review process, proposals are selected based on their relevance and importance to solution of problems faced by the industry.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this research program is to enhance the knowledge and technology base necessary for the continued growth of the domestic aquaculture industry. Emphasis is placed on re-

search leading to improved production efficiency, increased competitiveness, and wise environmental stewardship. Studies have led to a better understanding of several diseases and fish health problems affecting the industry. Research has led to improved methods for the detection and diagnosis of diseases of catfish, trout, salmon, and shellfish. Research aimed at vaccine development for important diseases of trout and catfish has led to the commercialization of vaccines. Researchers are currently investigating the reduction of waste from aquaculture production systems through improved feeds and feeding strategies.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1981, \$500,000; in fiscal years 1982 through 1985, \$518,000 per year; fiscal year 1986, \$285,000; fiscal year 1987, \$485,000; fiscal year 1988, \$660,000; fiscal year 1989, \$520,000; fiscal year 1990, \$563,000; in fiscal year 1991, \$656,000; and fiscal years 1992-1993, \$316,000 per year; and fiscal year 1994, \$297,000. A total of \$6,670,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. CSRS estimates that non-federal funding for fiscal years 1991-1993 was approximately \$540,000. The primary source of non-federal funding was from state sources.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. In fiscal year 1993 grants were awarded to Alabama and Maryland.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be finished?

Dr. JORDAN. A termination date for this program has not been established.

AQUACULTURE, ILLINOIS

Mr. DURBIN. Please provide a description of the research that has been funded under the aquaculture, Illinois grant.

Dr. JORDAN. Researchers are developing and evaluating closed system technology for application to commercial aquaculture. System design analysis has been completed and commercial trials and pilot studies are underway. The fiscal year 1993 grant supports research through December 1994. The fiscal year 1994 grant proposal has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The development of alternative aquaculture production systems, such as closed recirculating systems, would reduce demands for water and would provide for greater control over production in aquacultural systems. Closed systems could be established independent of climatic condition in any region of the country. These systems also offer greater opportunity to manage aquacultural waste and reduce environmental impact.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this program is to develop closed recirculating aquacultural systems in order to lower production cost, improve product quality, and reduce the potential environmental impact of aquacultural production systems. Initial system design analysis has led to the development of three systems that are currently in various stages of evaluation. Commercial trials and pilot studies have been initiated with the private sector. The economic analysis of management strategies and on-farm seedstock production is continuing. Researchers are also conducting studies on effluent characterization and the production of on-farm aquaculture feeds using midwestern grains.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 was \$200,000 per year; and fiscal year 1994, \$188,000. A total of \$588,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university estimates that non-federal funding for this program is as follows: in fiscal year 1992, \$370,000 and in fiscal year 1993, \$126,000. The primary source of funding is from the state with gifts and grants accounting for the remainder. This estimate does not include substantial in-kind contributions from industry as this program conducts cooperative research with commercial producers.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Illinois State University at Normal, Illinois, through a subcontract with the University of Illinois.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1997.

AQUACULTURE, LOUISIANA

Mr. DURBIN. Please provide a description of the research that has been funded under the aquaculture, Louisiana grant.

Dr. JORDAN. Research has focused on catfish, crawfish, redbfish, and hybrid striped bass in commercial aquaculture. Basic and applied research has been conducted as well as field testing of technologies developed. The fiscal year 1993 grant supports research through February 1995. The fiscal year 1994 proposal has been requested but has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Research funded through this program focuses on the production of aquaculture species such as catfish, crawfish, hybrid striped bass, and redbfish. The principal researcher indicates that there is a need to improve production efficiency in order to enhance the profitability and sustainability of the aquaculture industry. The research also addresses the issue of food safety and quality of farm-raised products.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to expand the technology base to enhance the development of aquaculture through a broad research program that addresses the needs of the industry. The university has completed studies in the area of fish nutrition, fish health, production management strategies, alternative species and broodstock development. Field testing in cooperation with commercial producers is also underway.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Research to be conducted under this program continues research initiated under the Aquaculture General program in fiscal years 1988 through 1991. The work supported by this new grant category began in fiscal year 1992 and the appropriation for fiscal years 1992-1993 was \$390,000 per year, and \$367,000 in 1994 for a total of \$1,147,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university estimates that non-federal funding for this program is as follows: in fiscal year 1991, \$310,051; in fiscal year 1992, \$266,857; and in fiscal year 1993, \$249,320. The primary source of this funding is from state sources with minor contributions from industry and other non-federal sources.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Louisiana State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1997.

AQUACULTURE RESEARCH, STONEVILLE, MISSISSIPPI

Mr. DURBIN. Please provide a description of the research funded under the aquaculture research Stoneville, Mississippi, grant.

Dr. JORDAN. The primary objectives of this research are to improve practical feeds and feeding regimes, and to determine the causes of off-flavor in channel catfish and develop treatments to reduce the incidence of off-flavor in ponds. Additionally, scientists are evaluating the application of acoustical instrumentation in commercial aquaculture. The fiscal year 1993 research grant extends through December 1994. The fiscal year 1994 grant has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research.

Dr. JORDAN. The farm-raised catfish industry accounts for over 55 percent of the total U.S. aquaculture industry. Research funded in this program is directed towards two of the most important research needs of the industry, off-flavor and improved feeds. Research findings have a direct impact on the profitability and sustainability of a significant segment of the domestic aquaculture industry.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to address the research needs of the catfish industry in the areas of water quality and nutrition. The research has led to an improved understanding of the sources and causes of off-flavor in commercial catfish ponds. Researchers are investigating the use of copper sulfate and other herbicides to control off-flavor. Research in the area of feeding strategies has led to improved diet formulation and feeding strategies. Scientists are currently evaluating the effects of reduced protein levels in catfish feeds under conditions that closely reflect commercial catfish ponds. Studies using acoustical instrumentation have demonstrated possible applications in commercial aquaculture. Researchers are designing and developing a new scanning sonar to determine fish size and number in aquaculture ponds.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1980-81, \$150,000 per year; fiscal year 1982, \$240,000; fiscal years 1983-84, \$270,000 per year; fiscal year 1985, \$420,000; fiscal years 1986-87, \$400,000 per year; fiscal year 1988, \$500,000; fiscal year 1989, \$588,000; fiscal year 1990, \$581,000; fiscal year 1991, \$600,000; fiscal years 1992-1993, \$700,000 per year; and fiscal year 1994, \$658,000. A total of \$6,627,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university reports a total of \$1,913,392 in non-federal funding to support this research for fiscal years 1991-1993. The primary source of non-federal funding is from the state. Additional funding is provided from product sales, industry contributions, and other miscellaneous sources.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the Mississippi Agricultural Experiment Station. All research is conducted at the Delta Branch Experiment Station, Stoneville, Mississippi. The acoustical research in aquaculture will be conducted in cooperation with the National Center for Physical Acoustics at the University of Mississippi.

Mr. DURBIN. When do the principal researchers carrying out this research anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that the research will be completed in fiscal year 1997.

ASIAN PRODUCTS LABORATORY, OREGON

Mr. DURBIN. Please provide a description of the work that has been done under the Asian products laboratory program grant?

Dr. JORDAN. The purpose of this grant is to equip a laboratory at the Wheat Marketing Center in Portland to conduct research on the attributes of wheat flour needed to produce noodles and noodle products acceptable to consumers in the rapidly growing Pacific Rim market. Protocols will be developed to meet alternative needs and translated into languages to facilitate use of domestic wheat

flours by foreign millers. CSRS has requested submission of a proposal which has not been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Canada and Australia have implemented research and production and processing strategies to capture a larger share of the wheat flour market for noodles in the Pacific Rim. The product research to be conducted under this grant represents another strategy designed to retain market share for the U.S. in an increasingly competitive market.

Mr. DURBIN. What was the goal of this research?

Dr. JORDAN. The goal of this project is to develop wheat flours for the production of noodles by Pacific Rim processors in order to keep the U.S. competitive in these markets.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$235,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources estimated for this grant are as follows: \$88,517 State appropriations.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work will be carried out at the Wheat Marketing Center at Portland, Oregon.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed.

Dr. JORDAN. CSRS has not been informed of the expected duration since the initial proposal has not been received.

BABCOCK INSTITUTE FOR INTERNATIONAL DAIRY RESEARCH AND DEVELOPMENT

Mr. DURBIN. Please provide a description of the research that has been funded under the Babcock Institute grant.

Dr. JORDAN. The Babcock Institute for International Dairy Research and Development was established with participation of the University of Wisconsin-Madison College of Agriculture and Life Sciences, School of Veterinary Medicine and the Cooperative Extension Division. The objective of the Babcock Institute is to link the U.S. dairy industry with the rest of the world through degree training, continuing education, technology transfer, adaptive research, scientific collaboration and market analysis. The fiscal year 1993 grant supports work through June, 1994. The fiscal year 1994 grant proposal from the University of Wisconsin has been received and is currently under review.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The need is to strengthen dairy industries around the world, to enhance international commercial and scientific collaborative opportunities for the U.S. dairy industry and to draw

upon global perspectives to build insight into the strategic planning of the U.S. dairy industry.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the Institute remains the linkage of the U.S. dairy industry with the rest of the world through training, continuing education and outreach, technology transfer, adaptive research, scientific collaboration and market analysis. Initial efforts were focused on planning and staffing. An initial activity was the development of multi/language extension materials about basic management techniques essential to optimize performance of U.S. germplasm overseas. Research on potential implications of NAFTA on the U.S. dairy industry was completed. A technical workshop on dairy grazing in New Zealand and the midwest was organized and held in Madison during the fall of 1993.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1992 and 1993, \$75,000 per year; and fiscal year 1994, \$235,000. A total of \$385,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. During fiscal year 1992, \$13,145 of State funds were used to support this program and \$19,745 of State funds in fiscal year 1993 for a total of \$32,890 during the first two years of this research.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Wisconsin-Madison College of Agriculture and Life Sciences.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work currently underway will be completed in June, 1995.

BEEF CARCASS EVALUATION AND IDENTIFICATION

Mr. DURBIN. Please provide a description of the research that has been funded under the beef carcass evaluation and identification grant.

Dr. JORDAN. The overall objectives for the project are to develop the most useful ultrasound technologies and genetic evaluation methods for predicting quantity of lean and quality of meat in cattle and to determine the mechanism of genetic control of beef carcass merit traits. The fiscal year 1993 grants terminate between February 1994 and September 1994. CSRS has requested the four universities to submit grant proposals for fiscal year 1994. The proposals have been received and are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The objectives of the research are to develop an improved, objective ultrasound-based grading system that will ensure that the price paid by consumers mirrors the value of the product. The technology could be of national interest.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Progress toward the original goal to produce low fat, high quality, nutritious meat has been made on each of the objectives identified for this project. The University of Illinois conducted studies and collected data to evaluate the performance of the ultrasound instrument that was constructed the previous year. Texas A&M University screened microsatellite markers and analyzed genetic linkage associations and linkages to phenotypes. Iowa State University investigated the use of real-time imagery to predict rib eye area and fat cover in cattle. The University of Georgia assessed previously developed equations to examine real-time ultrasound for live animal evaluation and the prediction of beef carcass merit.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993 was \$210,000 per year, and fiscal year 1994, \$197,000. A total of \$617,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$13,725 state appropriations and \$50,000 industry, in 1991; \$14,813 state appropriations and \$50,000 industry, in 1992; and \$168,389 state appropriations, \$117,771 product sales, and \$242,464 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Illinois, Texas A&M University, Iowa State University, and the University of Georgia.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work be completed in fiscal year 1996.

BEEF FAT CONTENT, IOWA

Mr. DURBIN. Please provide a description of the research that has been funded under the beef fat content grant.

Dr. JORDAN. The overall goal of the project is to demonstrate the ability to implement and manage systems of cattle breeding and production targeted to specification beef markets. The fiscal year 1993 grant supports research through September 1994. CSRS requested the university to submit a grant proposal for fiscal year 1994. It has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local needs for this research?

Dr. JORDAN. The research being conducted under this project has a national focus. The use of real-time ultrasound to measure body composition in live beef animals and in carcasses will be an integral part of ongoing national genetic improvement programs sponsored by beef breed associations. Trained ultrasound technicians

will be collecting images from feedstock herds in just about every state and sending the information to the national association of offices for processing. The same technology will also be used in beef packing facilities as an integral part of instrument grading systems where the quality of every animal will be objectively measured immediately after slaughter. This information will be used in pricing the product, and it will also be provided back to the producer.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original research objectives were to demonstrate the feasibility of using real-time ultrasound equipment in on-farm production environments; characterize beef animals relative to genetic merit for the production of specification beef carcasses; to demonstrate the practical application of expected progeny differences in carcass merit to tailor beef carcasses to alternative specification end-points; and optimize real-time ultrasound imaging for purposes of measuring body composition in live beef animals. Real-time ultrasound capabilities to accurately measure body composition have been developed and successfully tested. The technology is being transferred into PC software that can be marketed commercially.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal year 1991 was \$200,000. The fiscal years 1992-1993 appropriations were \$237,000 per year; and for fiscal year 1994, \$233,000. A total of \$897,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows \$114,640 state appropriations and \$1,528 miscellaneous in 1991; \$123,441 state appropriations and \$4,433 miscellaneous in 1992; and \$69,732 state appropriations and \$5,599 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Iowa State University, Ames, Iowa.

Mr. DURBIN. When do the principal researchers carry out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipated that work may be completed in fiscal year 1995.

BIODIESEL RESEARCH, MISSOURI

Mr. DURBIN. Please provide a description of the research that has been funded under the biodiesel research grant.

Dr. JORDAN. The economics of producing biodiesel is the main thrust of this program. In addition, a simulation model is being developed to examine the parameters of a biodiesel program from crop initiation to fuel and coproduct production.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The development of a viable alternative diesel fuel program from biomass is national in scope. The results of this research will be applicable throughout the nation through application of findings to specific site generation and usage of biodiesel fuels. Preliminary results indicate biodiesel comparable to petroleum-derived fuel and to be biodegradable and environmentally benign. Such attributes could make biodiesel a strong contender for use provided it is an economically-sound product.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. This research intends to examine the economic and physical parameters associated with the development of biodiesel. Assimilation of the process will be developed, tested, and the sensitivity of each parameter determined. Economic factors concerned with the performance of vegetable oils as fuel have been examined. A model has been defined. The practicality of oilseed crops as a source of biodiesel becomes moot if the economics are not positive. This simulation model is to be verified.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993, and the appropriation for fiscal year 1993 was \$50,000. The appropriation for fiscal year 1994 is \$141,000. A total of \$191,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The University of Missouri contributed \$24,185 to this project in fiscal year 1993. We do not, as yet, have the fiscal 1994 proposal.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at The University of Missouri-Columbia, Department of Agronomy.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1996.

BROOM SNAKEWEED

Mr. DURBIN. Please provide a description of the research that has been funded under the Broom Snakeweed, New Mexico grant.

Dr. JORDAN. Current research addresses several areas for broom snakeweed control, including efforts to understand the biological characteristics of snakeweed, such as whole plant physiology, seedbank ecology, population dynamics, competitive interactions and investigate any beneficial values of broom snakeweed. Another objective is to develop biologically sound strategies for increasing snakeweed death rate and suppressing germination. Problems associated with animal toxicity are also being studied. The ultimate goals are to develop control programs that are economically, environmentally, and socially acceptable and to increase utilization of natural weed controls.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The project is of regional interest. Broom snakeweed is a serious weed in Southwestern U.S. and adjacent Western States. About 22 percent of rangeland in Texas, and 60 percent of New Mexico are infested to some degree by the weed. Current cost for control of broom snakeweed in the southwest United States is estimated at over \$41 million. Snakeweed is a poisonous plant causing death or abortion in livestock and is a weed which reduces the productivity of associated vegetation.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to understand more fully the onset of invasion and persistence of broom snakeweed; evaluating the toxicology and physiological effects of broom snakeweed on livestock; and developing an integrated weed management approach for broom snakeweed.

A statewide survey to determine the distribution and relative infestation of snakeweed in New Mexico was completed in summer 1993. Areas having abundant grass cover acted to suppress snakeweed establishment. Coarse-resolution satellite data has been used to monitor low, moderate or heavy relative snakeweed infestation levels as rangeland.

Biological controls of broom snakeweed collected from 9 locations representing different environmental conditions in New Mexico are being maintained in the greenhouse and a common garden near Las Cruces, NM. The response of biological control agents to genetic variability in each populations is being studied. Feeding differences by various insect and pathogens agents has been demonstrated. The snakeweed rust fungus—*Puccinia grindelia*—has been shown to be widespread. Snakeweed mortality can be linked to areas of high rust incidence; however its effectiveness depends on favorable weather conditions. Research continues on developing methods for augmenting rust by culturing and introducing the pathogen to selected areas.

Ecology and management studies relate grass biomass to the amount of broom snakeweed occupying blue grama grassland over time. Minimum suppression of grass growth occurred with complete elimination of snakeweed, suggesting control strategies with near 100 percent mortality will likely be most beneficial to understory production. Burning low volatile blue grama grassland under a prescription developed by burning small plots in spring and summer under varying fuel load and air temperatures regimes indicated fire controls about 70 to 90 percent of mature snakeweed.

Toxicology of cattle was studied to determine effects of snakeweed consumption on animal performance. Cattle weight indicated consumption of snakeweed reduced total body weight. Consumption of snakeweed did not alter the breeding date or conception rate as pregnancy was similar among diets. Findings suggest it may be beneficial to supplement livestock on rangelands especially when adequate forage is lacking.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$100,000; fiscal year 1990, \$148,000; fiscal year 1991, \$150,000; fiscal years 1992 and 1993, \$200,000 per year; and fiscal year 1994, \$188,000. A total of \$986,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$249,251 state appropriations in 1991; \$200,110 state appropriations in 1992; and \$334,779 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at New Mexico State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Significant research can be accomplished in about two years. Most of the research is conducted in the field and progress is limited by the length of the growing season.

CANOLA RESEARCH SPECIAL GRANT, KANSAS STATE UNIVERSITY

Mr. DURBIN. Please provide a description of the research that has been funded under the Canola Research grant.

Dr. JORDAN. Canola germplasm lines are being developed that will survive the winter in the central Great Plains. This will be accomplished using a plant breeding program.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The domestic demand for canola oil has been increasing rapidly. With little domestic production, most of the demand has been met by imports. With limited production, private seed companies have not yet devoted time or money to developing the cultivars needed for canola production in Kansas.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to collect germplasm with increased winter hardiness and use it to develop cultivars with sufficient winter survivability to be grown in the central Great Plains. Over 500 lines and cultivars have been acquired and the hardiest have been used as parents to produce lines that will begin being tested in the field and laboratory during the fall of 1994. Additional plant introduction lines are currently being acquired and tested and additional crosses will be made as more winter hardy lines are identified.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Work began on this project in 1992. Funding for fiscal year 1992 and fiscal year 1993, was \$100,000 each and fiscal year 1994 was \$94,000. A total of \$294,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Kansas State University has provided \$44,960 in fiscal year 92, \$21,321 in fiscal year 93, and \$22,336 in fiscal year 94. An additional \$50,000 was provided through a grant from the Dane G. Hansen Foundation for fiscal years 93-95.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is being conducted at Kansas State University, Agricultural Experiment Station, Department of Agronomy. The primary research site is at Manhattan with additional field locations at Hutchison, Hays, and Colby, Kansas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The Kansas State University-Agricultural Experiment Station will continue to support research on canola as long as grower interest exists.

CENTER FOR ANIMAL HEALTH AND PRODUCTIVITY, PENNSYLVANIA

Mr. DURBIN. Please provide a description of the research that has been funded under the Center for Animal Health and Productivity grant.

Dr. JORDAN. The goal of the research is to reduce nutrient transfer to the environment surrounding dairy farms in the northeast. Progress to date includes the development of an individual dairy cow model which will predict absorbed amino acids and the loss of nitrogen in feces and urine. Background literature has been reviewed for the development of a prototype farm model to integrate cow feeding and crop production data. The fiscal year 1993 grant supports research through June, 1995.

Mr. DURBIN. According to the research proposal, or the principal research, what is the national, regional or local need for this research?

Dr. JORDAN. Reducing non-point pollution of ground and surface water by nitrogen from intensive livestock production units is of increasing concern nationally, and especially in the region draining into the Chesapeake Bay. This research is designed to find alternative feeding and cropping systems which will reduce net nutrient flux on Pennsylvania dairy farms to zero.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research remains the development of whole farm management systems which will reduce nutrient losses to the environment to zero. To date the researchers have developed their own models to more accurately formulate rations for individual dairy cows which permit the comparison of alternative feeding programs.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. A grant has been awarded from funds appropriated in fiscal year 1993 for \$134,000. A grant for fiscal year 1994 of \$126,000 has been appropriated. A total of \$260,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This information is not available at the present time.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Pennsylvania, College of Veterinary Medicine.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work currently underway will be completed in June, 1995.

CENTER FOR RURAL STUDIES, VERMONT

Mr. DURBIN. Please provide a description of the research that has been funded under the Center for Rural Studies grant.

Dr. JORDAN. The University has developed a database of social and economic indicators for small business and community economic development. Businesses, institutions, and citizen groups in the State can request technical assistance from the Center in developing their business plans or strategic plans for their town or rural community. The fiscal year 1993 grant supports research through August 1994. The fiscal year 1994 proposal has been requested but has not been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The database and analytical capability provide technical indicators and timely information to support entrepreneurial and community development activities in the State. The program is conducted in concert with other University and State agency outreach activities.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to create a database and analytical capability for rural development in Vermont. Examples of recent accomplishments include the following: Socioeconomic data from the Center was presented in the form of thematic maps to help a child hunger advocacy group working with University of Vermont nutritionists target those places for programmatic intervention. Similarly, Center analytical reports condensed from public data sources were provided to a retail shopping mall to help it attract new business to fill vacant space. A reference volume, "Economic Handbook for Vermont Counties," has been produced for public distribution to help Vermont citizens and leaders answer the most frequently asked questions about their State or its counties.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work support by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992-1993 was \$37,000 per year; and fiscal year 1994, \$35,000. A total of \$109,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year.

Dr. JORDAN. Prior to receipt of any Federal funds in fiscal year 1991, the Center was supported by \$91,130 in State and other non-federal funds. In fiscal year 1992, these funds increased to \$101,298 and to \$143,124 in fiscal year 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Vermont.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers have not provided a termination date.

CHESAPEAKE BAY AQUACULTURE, MARYLAND

Mr. DURBIN. Please provide a description of the research funded under the Chesapeake Bay Aquaculture grant.

Dr. JORDAN. The objective of this research is to improve the culture of striped bass and the American oyster through genetics, reproductive biology, nutrition, and health management. The fiscal year 1993 grant extends through August 1995. The fiscal year 1994 grant proposal has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The Mid-Atlantic region of the country has significant opportunities to contribute to the overall development of the domestic aquaculture industry. Research supported through this program can have regional application and enhance production efficiency and the sustainability of aquaculture as a form of production agriculture.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The research goal was to generate new knowledge that can be utilized by the aquaculture industry to address serious problems limiting the expansion of the industry in Maryland and the Mid-Atlantic region. The program continues to focus on the areas of reproductive biology, broodstock improvement, nutritional biochemistry, and fish health. Research in the area of reproductive biology has led to greater control of artificial spawning of the hybrid striped bass. Researchers have made progress in developing domestic stocks of striped bass for commercial aquaculture. Scientists are conducting studies aimed at optimizing phosphorus utilization in hybrid striped bass diets. Significant progress has been made in understanding the mechanisms of important diseases in oysters.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported under this grant began in fiscal year 1990 and the appropriation for fiscal year 1990 was \$370,000. The appropriation for fiscal years 1991-1993 was \$437,000 per year, and fiscal year 1994, \$411,000. A total of \$2,092,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university reports the amount of non-federal funding for this program is as follows: in fiscal years 1991 and 1992, \$200,000; in fiscal years 1993 and 1994, \$175,000. The university reports that 40 percent of these funds are from direct state appropriations and 60 percent of these funds are from other non-federal funding sources.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. Research is being conducted at the University of Maryland.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that this work will be completed?

Dr. JORDAN. The university researchers anticipate that the work will be completed in fiscal year 1997.

COMPETITIVENESS OF AGRICULTURAL PRODUCTS, WASHINGTON

Mr. DURBIN. Please provide a description of the work that has been done under the competitiveness of agriculture products program?

Dr. JORDAN. This grant is for the purpose of improving the global competitiveness of agricultural and forest products, especially value-added products, produced in the Pacific Northwest region. This is accomplished through a program of research of foreign market assessments, product development, and policy and trade barrier studies in conjunction with use of appropriate outreach programs. The fiscal year 1994 proposals have been submitted to CSRS and are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional, or local need for this research?

Dr. JORDAN. Rural economic development and growth of the Pacific Northwest region is dependent upon the ability of the agricultural and forest products sectors to penetrate and maintain exports of food and forest products in overseas markets, especially in the Pacific Rim countries. While the research has a regional focus, results of many of the projects are adaptable by other regions of the U.S.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to conduct a research program that would support the development of export markets for value-added food and forest products produced in the Pacific Northwest.

Studies at Washington State University have been completed on the expected impacts of the North American Free Trade Agreement, a dietary fiber that can be included in a variety of foods, market testing of Walla Walla onions in export markets, developing resistance in potatoes to black spot bruise to improve marketability, fumigation controls for Christmas trees to allow export, irradiation to control TCK smut, a rapid assay for detecting blackrot in curcifer seed for export, factors causing brownleaf in Timothy hay with remedies, and export market assessment studies for apples, hay and livestock products. Ongoing projects are expanding exports of azuki beans, edamame, basabi radish, Wagyu cattle and beef, red lentils and surimi from carp and pink salmon. Several projects at the University of Washington have been completed on

forest products including competitiveness in key markets such as Japan; a preliminary analysis of the North American Free Trade Agreement impacts; assessment of quality factors on marketability of forest products, inventory and trade flows for the former Soviet Union, Eastern European countries, and People's Republic of China; competitive softwood supplies from New Zealand, Australia, and Chile; a survey of secondary wood product manufacturing capability; completion and operation of a forest products global trade model to assess competitiveness and environmental policy implications; a patent for a cell wall filled pulp that increases fiber yield; assessment of endangered species proposal impacts on the Pacific-Northwest forest products industry; and meetings and workshops to disseminate results. New and on-going projects include a survey and analysis of the U.S. wood molding and mill work industry; analysis of distribution channels and business relationships for value-added wood products in Japan; opportunities for the export of wood furniture and other wood products; quality factors affecting U.S. competitiveness; additional country studies to assess their competitiveness; assessment of implications of the new Common Market wood product standards; development of a strategic alliance to increase wood exports to China; evaluation of implications of new environmental policies on the industry; and chemical recovery from the filled pulp project.

Mr. DURBIN. How long has the work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 was \$800,000 per year; and fiscal year 1994, \$752,000. A total of \$2,357,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$716,986 State appropriations, \$209,622 product sales, \$114,000 industry, and \$661,119 miscellaneous for a total of \$1,701,727 in 1991; \$727,345 State appropriations, \$114,581 product sales, \$299,000 industry, and \$347,425 miscellaneous for a total of \$1,488,351 in 1992; and \$1,259,437 State appropriations, \$55,089 product sales, \$131,000 industry, and \$3,000 miscellaneous for a total of \$1,448,526 in 1993. The university has not determined the allocation of non-federal funds for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is being carried out at Washington State University, Pullman, and the University of Washington, Seattle.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The current program of work may be completed in 1997.

CONTROLLED ENVIRONMENTAL PRODUCTION SYSTEMS, PENNSYLVANIA

Mr. DURBIN. Please provide a description of the research that has been funded under the controlled environmental production systems grant.

Dr. JORDAN. Work started in fiscal year 1992 on optimizing the performance of high value horticultural crops in well controlled environments to reduce any environmental impacts on the rural and urban interface. The fiscal year 1993 grant supports research through March 1996. The fiscal year 1994 grant has been received and is being processed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The state and Northeast regional goal for this grant is to develop environmental friendly growing systems for high value horticultural crops that are productive while maintaining or improving the overall environment.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal for this grant was to optimize the production of selected high value horticultural crops in relatively precisely controlled growing environments. Research has been initiated on various parameters to control environmental variables. Progress has been made in water and nutrient management. Plans have been made and initial research has started in new directions to control field environments. Uncleaned mineral wool, a waste product in the manufacturer of cleaned mineral wool, was tried as a replacement for existing, expensive greenhouse plant growing media. Results to date indicate it can be used if some peat moss is added. In 1993, work was started on the growth and production of strawberries when root zone temperatures are controlled. In 1994, work will start on a no-till tomato transplant system.

Mr. DURBIN. How long has this work been underway and how much has been appropriated for fiscal year through 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992-1993 was \$240,000 per year, and fiscal year 1994, \$226,000. A total of \$706,000 has been appropriated.

Mr. DURBIN. What is the source of amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$522,190 state; \$58,126 industry in 1992; \$432,453 state, \$52,911 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Pennsylvania State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1996.

COOL SEASON LEGUME RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the Cool Season Legume Research special grant.

Dr. JORDAN. The Cool Season Legume Research Program involves projects to improve efficiency and sustainability of pea, lentil, chickpea and fava bean cropping systems collaborative research.

Scientists from seven states where these crops are grown have developed cooperative research projects directed toward crop improvement, crop protection, crop management and human nutrition/product development.

Mr. DURBIN. According to the research proposal, or principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. These crops are major cool season food legumes for temperate regions of the world. In the United States diseases, insect, weed and environmental stress problems have increased in recent years reducing their economic competitiveness. Since these crops are key rotation crops in the sustainable production of major cash crops, e.g. wheat, research to maintain or increase their competitiveness has important regional impact.

Mr. DURBIN. What was the original goal of the research and what has been accomplished to date?

Dr. JORDAN. The original goal of this project was to improve efficiency and sustainability of cool season food legumes through an integrated collaborative research program and genetic resistance to important virus diseases in peas and lentils. Evaluation studies of biocontrol agents for root disease organisms on peas are underway. Other studies are evaluating integration of genetic resistance and chemical control. Considerable progress has been made using biotechnology to facilitate gene identification and transfer. Management system studies have addressed tillage and weed control issues.

Mr. DURBIN. How long has the work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 with appropriations for fiscal year 1991 of \$375,000; for fiscal years 1992 and 1993 were \$387,000 per year; fiscal year 1994, \$364,000. A total of \$1,513,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds provided for this grant were as follows: \$304,761 state appropriations, \$14,000 industry, and \$18,071 miscellaneous in 1991; \$364,851 state appropriations, \$15,000 industry and \$14,000 miscellaneous in 1992; and \$400,191 state appropriations, \$19,725 industry and \$10,063 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at agricultural experiment stations in Idaho, Oregon, Washington, Wisconsin, Minnesota, New York and New Hampshire.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The current research is anticipated to run through fiscal 1996.

COTTONSEED EXTRACTION AND OIL REFINING, TEXAS

Mr. DURBIN. Please provide a description of the research that has been funded under the cottonseed extraction and oil refining grant.

Dr. JORDAN. Research has been aimed at developing an efficient process for the extraction, degumming and refining of cottonseed oil, using isopropyl alcohol rather than hexane as a solvent. A change in solvents is needed because of concerns about long-term toxicity effects of hexane, as well as its relatively high flammability. In the last year, the investigators believe a breakthrough has occurred by changing to high-content isopropyl alcohol solvent in place of the traditionally tried, but not competitive, isopropyl alcohol water azeotrope. The researchers hope to modify the process developed in this project for extraction of all row crop oilseeds.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national regional or local need for this research?

Dr. JORDAN. There is a national need for this research. The 1990 Congressional Amendment to the Clean Air Act listed n-hexane as a hazardous air pollutant. This compound is a major component of commercial hexane which is used exclusively for extracting all of the nation's edible vegetable oils from crops grown in various parts of the United States. The domestic oilseeds extraction industry is expecting increased EPA compliance/implementation pressures because of the Amendment and needs an alternative solvent.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The major objective is to develop a process for extracting oil from cottonseed using isopropyl alcohol rather than hexane. Techniques have been optimized for reducing costs of preparing cottonseed for extraction, but these changes are not sufficient to overcome the major energy upcharge for using isopropyl alcohol in place of hexane. The breakthrough in using high-concentration isopropyl alcohol would not have been considered just a few years ago before techniques were developed to recover this solvent at affordable costs.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991. The appropriations for fiscal years 1991-1993 were \$75,000 per year, and fiscal year 1994, \$70,000. A total of \$295,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The State of Texas contributed \$35,000 in fiscal year 1991, \$72,500 in 1992 and again in 1993, and \$37,200 in 1994. Other non-federal, non-State contributions include \$9,500 in fiscal year 1991, \$45,950 in 1993 and \$55,952 in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Texas A&M University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The investigators expect that work will be completed with the assistance of an appropriation in fiscal year 1995.

CRANBERRY-BLUEBERRY DISEASE AND BREEDING, NEW JERSEY

Mr. DURBIN. Please provide a description of the research that has been funded under the cranberry-Blueberry Disease and Breeding, New Jersey grant.

Dr. JORDAN. This work has focused on the identification, breeding, and incorporation of superior germplasm into horticulturally-viable genotypes. Research has also included important efforts on weed control, integrated pest management, biology of fungal pathogens, and efficacy and fate of environmentally-compatible pesticides.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Although this work involves diseases having major impacts on New Jersey's cranberry and blueberry industries, the findings here are closely followed by scientists in Wisconsin, Michigan, and New England.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to develop cranberry and blueberry cultivars compatible with new disease and production management strategies. Additional crosses among a wide range of cranberry germplasm were made, and several thousand seedlings are being maintained for selection of superior types. Studies on various materials and methods of weed control were continued. Certain herbicides were found to control redroot, a widely found weed pest. Napapromide was found to give good weed control, while not affecting crop yield. Ten growers participated in the Integrated Pest Management—IPM—Program. Over 500 acres were scouted for growers managing over 2,000 acres. Surveys tracked changes in populations of various berry insect pests. Further studies on fungicides for control of selected diseases showed that Chlorothalonil is a suitable alternative for Difoltan. Research on fate of pesticides applied to berry fields showed a wide variety of concentrations in wells, groundwater, and soils.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, \$100,000; fiscal year 1986–1987, \$95,000 per year; fiscal years 1988 and 1989, \$260,000 per year; fiscal year 1990, \$275,000; fiscal years 1991–1993, \$260,000 per year; and fiscal year 1994, \$244,000. A total of \$2,091,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Specific non-federal funding amounts are not available at this time, but the institution indicates that state-appropriated funds have been and will continue to be applied to this grant.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the New Jersey Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that an additional three to ten years of research is necessary.

CRP ACREAGE USAGE, MISSOURI

Mr. DURBIN. Please provide a description of the work that has been done under the CRP acreage usage program.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a national need to gain a better understanding of how Federal environmental policies affect the production decisions of farmers and the output of food and fiber in the U.S. This information is crucial to ensuring a reasonable balance between agriculture and the environment.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to develop capability and analyze impacts of the CRP and related environmental programs on agriculture, and assess alternative policy measures.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The research supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$141,000. A \$50,000 grant was appropriated in 1992.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This is a new program and the university has not made an allocation of non-federal funds at this time.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work will be carried out at the University of Missouri.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. CSRS has not received the initial proposal containing the information on anticipated duration.

DAIRY GOAT RESEARCH, PRAIRIE VIEW A&M, TEXAS

Mr. DURBIN. Please provide a description of the research that has been funded under the dairy goat research grant?

Dr. JORDAN. The program has addressed a range of issues associated with goat production. Research by scientists at the International Dairy Goat Center, Prairie View A&M University focuses on a range of problems effecting goat production in the United States. Issues have included the study of nutritional requirements of goats, disease problems—e.g. *Corynebacterium pseudo-tuberculosis*—methods to improve reproductive efficiency in the doe, the use of gene transfer to improve caprine genetics and the evaluation of breeding schemes to improve meat and milk production.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Nationally, many of the enterprises that include goats are diverse and maintain relatively small numbers of animals. Responding to disease, nutrition, breeding and management problems will improve efficiency of production and economic returns to the enterprise.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to conduct research that will lead to improvements in goat production among many of the small producers in the United States. Research has been conducted to respond to issues important in improving nutritional standards, improve breeding lines for meat and milk production and understand mechanisms that impede reproductive efficiency in goats.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded through appropriated funds as follows: \$100,000 per year for fiscal years 1983-85; \$95,000 per year for fiscal years 1986-88; no funds were appropriated in fiscal year 1989; \$74,000 for fiscal year 1990; \$75,000 per year for fiscal years 1991-1993; and fiscal year 1994, \$70,000. A total of \$954,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university reports no non-federal funds expended on this program.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Prairie View A&M University in Texas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work will be completed in fiscal year 1997.

DELTA RURAL HEALTH CARE, ARKANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Delta Rural Health Care grant.

Dr. JORDAN. The research funded is to create a community-based health monitoring and clinical intervention program for disadvantaged counties in the Delta region of Arkansas. A survey of households in the target areas will be used to identify general problems. This will be followed up with medical evaluation teams traveling to the area with clinical facilities in a mobile van. The fiscal year 1993 grant proposal representing the first year of the project was approved late in fiscal year 1993. Operations using these funds are just beginning. The fiscal year 1994 proposal has not yet been requested by CSRS.

Mr. DURBIN. According to the research proposal, or principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The immediate need for this research is at the local level where health care problems have long been a serious impediment to economic progress and the quality of life for the local people. The research is also conducted as a pilot project to discover the mechanisms for effectively delivering health care in such situations. The monitoring, record keeping, and evaluative research integrated into this project has potential to be useful in helping to devise and finance new health care initiatives in rural areas.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to finance both clinical hardware and evaluative research programs to enhance health care for the residents of the Delta counties in Arkansas. Purchase of the hardware and facilities is nearing completion, and the design of the evaluative research and monitoring procedures is well underway. Researchers are working with local community organizations to specify the specific sites for both the survey and clinical work.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began with fiscal year 1993 appropriations earmarked under the Rural Policy Research Institute funding for that year; \$167,000 of the Rural Policy Research Institute grant was allocated to Arkansas Children's Hospital to run the Delta Rural Health Project. Fiscal year 1994 appropriations to the project then were made a separate line, and \$110,000 was appropriated in this year for a total of \$277,000 appropriated to the project to date.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The principal researcher has indicated that no non-federal funds have been used in conjunction with this grant.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research and clinical intervention are being performed by staff of the Arkansas Children's Hospital, Little Rock, Arkansas, in collaboration with the University of Arkansas for Medical Sciences, also in Little Rock.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The fiscal year 1993 funding will sustain the project through fiscal year 1994. The fiscal year proposal has not been received and so no termination date is known for the fiscal year 1994 funding.

DELTA RURAL REVITALIZATION, MISSISSIPPI

Mr. DURBIN. Please provide a description of the research that has been funded under the Delta Rural Revitalization grant.

Dr. JORDAN. This project has gone through several phases in the delineation of a strategy for a long-range development plan for the Mississippi Delta region. Phase I is now complete with the delivery of its first product, a reference or baseline assessment of the economic, social, and political factors that enhance or impede the advancement of the region. Phase II of the project evaluated the potential for entrepreneurship and small business creation as mecha-

nisms to improve economic conditions. Phase III, now in its first year, focuses on technical assistance to Delta region manufacturing firms to strengthen their ability to provide employment and incomes. Phase III is continued into the 1993 proposal with continuing emphasis on technical assistance to industry and the further development of a special industrial support database and analysis unit located at Stoneville, Mississippi.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The counties that comprise the Mississippi Delta region in northwestern Mississippi have traditionally been among the poorest of counties in the United States for well over a century. The cotton economy that made the Delta region famous has been subjected to many external forces as well as changes within the agricultural sector. It is desirable then to attempt to diversify the agriculturally dominant economy by encouraging an industrial development and growth process that will provide jobs and income for impoverished Delta residents.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to create an analytical baseline for the Delta region. A publication titled, "A Social and Economic Portrait of the Delta," was published last year and serves as an analytical baseline for further work. The second phase of the project created a Delta Inventors Society to assist creative persons in developing ideas which can be successfully commercialized, and a companion Entrepreneurial Forum was established to help new business ventures with start-up advice and assistance. Finally, a Venture Capital Association was formed to help both inventors and businessmen find capital resources to carry out their plans. A report covering the creation and initial activities of these groups was prepared in 1992. Evaluation of the impacts of these efforts will continue through September 1994. The focus of the project now has clearly shifted to industrial technical assistance, and the fiscal year 1993 proposal includes provisions to hire a qualified industrial consultant to work with selected Delta firms in a program of self improvement. With an independent database and analytical unit to monitor Delta economic factors, the impacts of the technical assistance can be determined over time.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$175,000; fiscal year 1990, \$173,000; fiscal years 1991-1993, \$175,000 per year; fiscal year 1994, \$164,000. A total of \$1,037,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Total non-federal funds directed to this project, as reported by Mississippi State University, are: fiscal year 1991, \$117,866; fiscal year 1992, \$84,402; and fiscal year 1993, \$68,961. These numbers include State and other non-federal sources under University accountancy. They do not include the indirect or direct contributions of local development organizations or commitments

made by local industrial firms in collaboration with the project. It is not possible to accurately reconstruct the value of the latter items.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Mississippi State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The funding awarded to date will continue to support evaluation studies through September 1994. The timetable for funding awarded in fiscal year 1993 cannot be determined until technical amendments are submitted. No timetable has been received for the funding appropriated in fiscal year 1994.

DOGWOOD ANTHRACNOSE

Mr. DURBIN. Please provide a description of the research that has been funded under the dogwood anthracnose grant.

Dr. JORDAN. In fiscal years 1991 through 1993, studies were conducted on tree location, drought effects, pathogen-plant material screening, acidity effects on the fungus, insect spread of the disease organism, and basic studies on the nature of the pathogen.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The flowering dogwood has become an important ornamental species selected from our national flora because of its aesthetic value in natural and managed ecosystems, and because of its economic impact in nursery value.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to develop dogwood anthracnose control strategies compatible with prudent management of trees growing in forest, landscape, and nursery habitats. The scientists will continue to study environmental factors affecting severity of the disease, including its geographic distribution, and interaction of the fungus with the plant host. Models based upon the data collected in the previous three years will be used for prediction of disease severity in urban, forest, and nursery environments in the southeastern U.S. Studies on the interactions with, and the role of insects in the spread of the fungal species will be continued in laboratory as well as field situations. Genetic variability of the fungal species will continue to be studied in regard to fungicide tolerance and ability to cause disease. Individuals of *Cornus* species possessing resistance to the fungus will be further studied to determine the reliability and mechanism of resistance for future incorporation into breeding programs.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 with an appropriation of \$100,000. The fiscal years 1992-1993 appropriation was \$137,000 and \$129,000 in fiscal year 1994. A total of \$503,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$38,830 state appropriations in 1991; \$125,396 state appropriations in 1992; and \$192,827 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the University of Tennessee, University of Georgia, North Carolina State University, and Virginia Polytechnic Institute and State University. The University of Tennessee continues to be the lead university for coordinating research toward the objectives of this grant.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1995.

DRIED BEAN RESEARCH, NORTH DAKOTA

Mr. DURBIN. Please provide a description of the work that has been funded under the Dried Bean Research, North Dakota special grant.

Dr. JORDAN. This project was designed to develop cultivars of edible dry beans with improved biological efficiency, pest resistance and nutritional quality for production in North Dakota. In addition, the research is assessing the potential for yield losses caused by pathogenic bacteria.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The regional need for this research is to maintain stable production of edible dry beans in the northern Great Plains. Diseases have a significant negative impact on bean seed quality and yield. Improved disease resistance and disease forecasting systems are needed for the crop to remain economically competitive.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to meet cultivar requirement for disease resistance and other production problems which would allow North Dakota dry bean farmers to remain competitive in the domestic and world market. Results to date include release of new cultivars that mature early, are high yielding with improved disease resistance and seed quality. Exotic germ plasm with resistance to bean rust has been introduced, and several sources of tolerance to common blight have been identified.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1977 and appropriations were for fiscal years 1977-1981, \$25,000 per year; fiscal year 1982, \$24,000; fiscal years 1983-1984, \$25,000 per year; fiscal year 1985, \$50,000; fiscal year 1986, \$87,000; fiscal years 1987-89, \$75,000 per year; fiscal year 1990, \$87,000; fiscal year 1991, \$93,000; fiscal years 1992-1993, \$100,000 per year; fiscal year 1994, \$94,000. A total of \$996,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds provided for this grant were as follows: \$38,422 state appropriations and \$12,843 miscellaneous in 1992, and \$38,329 state appropriations and \$16,938 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the North Dakota Agricultural Experiment Station, North Dakota State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that work will be completed?

Dr. JORDAN. The university researchers anticipate that this work may be completed in fiscal year 1995.

EASTERN FILBERT BLIGHT

Mr. DURBIN. Please provide a description of the research that has been funded under the Management of Eastern Filbert Blight grant.

Dr. JORDAN. Work on this project has involved screening hazelnut cultivars for blight resistance, basic studies on the biology and epidemiology of the eastern filbert blight fungus, and examination of the nature of infection of the host tree.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The disease, which spread from southwest Washington, affects almost 30,000 acres in Oregon's Willamette Valley. There are both local and regional needs for this research.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was the development of blight-resistant or immune hazelnut cultivars. Studies of over 4,000 seedlings resulting from hazelnut cultivar crosses have begun to yield information on levels of susceptibility to the blight. Evaluations have continued in the search for superior blight resistance in these seedlings. Cooperative screening experiments have identified certain fungicides most effective for blight control, and have provided insight into the appropriate phenological stages of hazelnut development on which to target fungicide applications. Additional cooperative research between the Oregon Station and the Agricultural Research Service, USDA, has contributed to a better understanding of the biology and epidemiology of the blight fungus.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991, and the appropriation for fiscal year 1991 was \$75,000. The appropriation for fiscal years 1992-1993 was \$85,000 per year; fiscal year 1994, \$80,000. The total amount appropriated is \$325,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$107,404 state appropriations in 1991; \$115,568 state appropriations in 1992; \$131,853 state appropriations in 1993; \$132,101 state appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Oregon State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work may be completed in fiscal year 1997.

ENERGY BIOMASS/BIOFUELS

Mr. DURBIN. Please provide a description of the research that has been under the energy biomass/biofuels program.

Dr. JORDAN. This program was initiated in fiscal year 1994. The request for proposal guidelines ask for the following areas of research to be addressed: First, benefit/costs associated with the production of biomass, its conversion into biofuels; second, environmental impacts of using biofuels including carbon sequestration, emissions upon conversion and use, systems sustainability, and life cycle (growing, processing, and use) analysis; third, economic analysis of costs of alternative fuels including infrastructure changes, equipment purchases and/or modifications, vehicle conversion and/or new alternative fuel vehicle costs, and other costs associated with establishing biofueled vehicle fleets; and development of biofuels including production, materials compatibility and assessment, and mitigation of engine deposits and emissions; and fourth, development of coproducts directly resulting from the production of biofuels.

Proposals must be submitted to CSRS by April 25, 1994.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The need for this research is national in scope. Effective and efficient use of renewable resources for fuel has implications throughout the nation. Reduction in the use of imported petroleum products, energy self-sufficiency, and economic stability are national goals that can be met, in part, by investing in this research.

Mr. DURBIN. What is the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to provide the nation with a fuel or fuels that originates from biomass that can be grown, harvested, and processed in the United States in an economical and environmentally-sound manner. No funds have been distributed to date. Proposals are to be accepted for the aforementioned research outline. Results will be forthcoming in the future.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$470,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This is a new program and the university has not made an allocation of non-federal funds at this time.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The grants which have not yet been awarded, will be determined by a competitive, peer review process.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Results are dependent on the subject matter, some of the economic projects may use data that are already known and, therefore, analyses can be initiated and completed in a relatively short time. Environment, ecosystem, and biomass growth studies may be long-term.

ENTOMOLOGY ACOUSTICS RESEARCH—MISSISSIPPI

Mr. DURBIN. Please provide a description of the research that has been funded under the Entomology Acoustics Research grant.

Dr. JORDAN. The University of Mississippi's National Center for Physical Acoustics submitted the proposal for entomology acoustics to CSRS in December 1993. The purpose of the project is to develop acoustic detection technologies for insect infestations in economically important crops such as grains, soybeans, nuts, cotton and citrus fruit. Prototype sensors for field use provide more reliable detection compared to traditional by-hand and visual methods.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Acoustic detection devices show promise to be relatively inexpensive and provide more rapid and accurate determination of insect infestation in a variety of agricultural commodities. This non-destructive testing reduces risks of market losses due to not meeting product specifications and can help to maintain current and perhaps open new world markets.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this project is to develop highly reliable and rapid acoustical detection devices to sense insect infestations in agricultural commodities. The fiscal year 1994 funds are for the project's first year.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994.

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 with an appropriation of \$188,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds are not provided for this research. The University of Mississippi and the National Center for Physical Acoustics provide unspecified in-kind support in the form of laboratory and office facilities, equipment and equipment maintenance, and administrative support services.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This project is being conducted by the University of Mississippi's National Center for Physical Acoustics, Oxford, Mississippi.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigator estimates that two more years will be required to complete the project.

ENVIRONMENTAL RESEARCH, NEW YORK

Mr. DURBIN. Please provide a description of the research that has been funded under the environmental research grant.

Dr. JORDAN. Two major components of this program are the nitrogen flows from agricultural ecosystems and their impacts on natural ecosystems and resources in a mixed ecosystem setting, and the agricultural dimensions of global climate change. The program also includes an environmental technology transfer aspect and an environmental assessment activity. The fiscal year 1993 grant supports research through February 1994. The fiscal year 1994 proposal has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. Given the general environmental issues, there could be a regional or potentially national need for research of the type conducted through this grant.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The overall goal of the program is to identify and address interactions and feedbacks between agricultural ecosystems, natural ecosystems, and natural resources that affect the long-term well being of each. A second goal is to delineate strategies for agroecosystem management that maintain agricultural productivity and environmental quality, and the third goal is to assist development of policies for addressing problems at the interface between agriculture and the environment.

The nitrogen utilization research has investigated the capacity of soils to supply nitrogen to crops and the timing of nitrogen supply, the effects of intercropping and fertilization practice on corn yield and nitrogen conservation in corn-based cropping systems typical for New York, and nitrogen cycling in the soil-plant system and its effect on recovery of fertilizer nitrogen at crop harvest. By concentrating on the soil-plant system these research topics address the initial, but critical, phase of nitrogen utilization in agricultural ecosystems. Fully half, or more of the fertilizer nitrogen losses from agricultural ecosystems occur because of inefficiencies in this part of the system.

From the water quality research a major conclusion is that protection of ground-water resources from excessive contamination by nitrates in areas of intensive animal production must rely on dilution by water from non-intensively farmed areas and volatilization of ammonia from surface applications of manure. The effect of volatilized ammonia on adjacent forested land cannot be quantitatively assessed on the basis of present evidence, but does not appear to be large.

The Geographic Information System work has developed the capability of simulating Geographic Information System layers at a landscape level, which is necessary for "what if" calculations using the landscape grid model. For example, to assess the impact of shutting down a dairy farm, it would be necessary to create a hypothetical landscape with the farm removed and a realistic landscape substituted. This could then be used in the landscape grid model to assess the impact of the farm.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 with an appropriation of \$297,000. The fiscal years 1992-1993 appropriation was \$575,000 per year; \$540,000 in fiscal year 1994. A total of \$1,987,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. In fiscal year 1991 Cornell University provided \$27,893 and the State of New York provided \$118,014. In fiscal year 1992 Cornell University provided \$37,476 and the State of New York \$188,915. In fiscal year 1993 Cornell University provided \$13,650 and the State of New York \$243,251. In fiscal year 1994 the State of New York is providing \$214,989.

Mr. DURBIN. Where is this research being carried out?

Dr. JORDAN. This research is being conducted at Cornell University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that this work will be completed?

Dr. JORDAN. The university researchers anticipate that this work may be completed in 1995.

EXPANDED WHEAT PASTURE, OKLAHOMA

Mr. DURBIN. Please provide a description of the research that has been funded under the Expanded Wheat Pasture, Oklahoma special grant.

Dr. JORDAN. This project was designed to develop improved supplementation programs and new systems for technology delivery to reduce production risk of growing cattle on wheat pasture. The work involves evaluation of grazing termination date on grain and beef production, assess the impact of wheat cultural practices and develop an economic model to evaluate alternative decisions on grain/beef production.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This work addresses the needs of wheat/cattle producers of Oklahoma as a primary focus. However, it would appear to have some application regionally in adjacent states.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to develop economically viable management systems for use of wheat for supplemental pasture for beef cattle before the crop starts making grain. This work has already shown how the use of feed supplements can increase net profit from cattle grazing on wheat pasture.

The study has identified management, practices, e.g. date of planting, cultivar selection, grazing intensity and date of cattle removal that produce the optimum grain yield and cattle gain. A Wheat/Stocker Management Model has been developed as a decision aid to help producers assess income risk in the operation. Work is underway on a Wheat Grazing Systems simulation model.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and appropriations were as follows: fiscal year 1989, \$400,000; fiscal year 1990, \$148,000; fiscal year 1991, \$275,000; fiscal years 1992-1993, \$337,000/year; fiscal year 1994, \$317,000. A total of \$1,814,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$175,796 state appropriations in 1991; \$174,074 state appropriations in 1992; and \$236,584 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being done at Oklahoma State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The scientists estimate this work will be completed in fiscal year 1995.

FARM AND RURAL BUSINESS FINANCE, ILLINOIS AND ARKANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the farm and rural business finance program.

Dr. JORDAN. The purpose of this program is to conduct research and disseminate results on three general areas: financial management and performance of farm and rural businesses; financial markets, and credit institutions serving rural America; and public finance policies and programs. Proposals have been received for fiscal year 1994 from the two universities and are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. There is a national and regional need by farmers, rural financial institutions, and other rural businesses for research results addressing credit problems and management options, implications of the dynamic changes occurring in the structure of financial markets, and impacts of changing public policies affecting financial institutions doing business in rural America.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to provide research-based information to assist farmers and rural businesses with the growing demands of an increasingly complex and dynamic financial marketplace.

The program has completed a variety of studies addressing the goals of this program. These studies include credit evaluation pro-

cedures, reverse mortgages and farm estate management, examination of farm asset returns, new farmer loan programs, cash versus accrual measures of income, experience with Chapter 12 bankruptcy, farm level effects of young farmer lending programs, and others. Twelve new projects will be undertaken with the 1994 funds including an evaluation of vertical coordination and financing arrangements, financing strategies for small farms and rural development, capital leasing arrangements, farm portfolio diversification and explaining farmland prices.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 was \$125,000 per year; fiscal year 1994, \$118,000. A total of \$368,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$58,427 State appropriations, \$189,000 industry, and \$12,000 miscellaneous for a total of \$259,427 in 1991; \$94,588 State appropriations, \$133,000 industry, \$25,000 miscellaneous for a total of \$252,588 in 1992; and \$87,890 State appropriations, \$115,000 industry, and \$85,000 miscellaneous for a total of \$287,890 in 1993. Final determination has not been made for the allocation of non-federal funds for fiscal year 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The work is being carried out at the University of Illinois and the University of Arkansas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal researchers consider this program to be an on-going research.

FISH MARKETING, OREGON AND RHODE ISLAND

Mr. DURBIN. Please provide a description of the work that has been done under the fish marketing program.

Dr. JORDAN. The purpose of this program is to conduct a targeted research program to find acceptable solutions to a number of fishery production, marketing and policy issues affecting the structure and economic well-being of the U.S. fisheries industry and develop an appropriate outreach program to transfer this information to the industry, consumers, and public policymakers. The two universities have submitted fiscal year 1994 grant proposals to CSRS, and they are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a national and regional need for research to address a number of fish marketing problems in the U.S. These problems include the identification and evaluation of markets, economic performance of the fisheries and aquacultural industries, assessment of policies affecting the safety and quality of fish products, and evaluation of fishery management decisions on fish prod-

uct supplies, and dissemination or research results to the U.S. fish industry. An industry advisory board advises the universities on research needs and priorities and evaluates published research.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal of this research is to conduct a program of fish marketing research to benefit fishermen, aquaculturists, marketers, and consumers and improve industry performance.

The two universities have developed a comprehensive strategic research plan and projects to implement this plan. Nineteen reports have been published including ones on seafood demand, seafood safety, forecasting of prices, analysis of the Japanese seafood market for U.S. seafood, global markets for hake, consumer willingness to pay for seafood safety, and price forecasting and hedging of fishmeal inventories. Twenty projects are in progress on such issues as quality assurance standards, trade policy impacts, groundfish processing preferences and biological limitations, market structure, price determination, alternative markets for salmon, and markets for mussels. The universities have developed a joint publication series to disseminate results quickly to the industry and policymakers.

Mr. DURBIN. How long has this project been underway, and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 is \$340,000 per year; \$320,000 in 1994. A total of \$1,000,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$224,577 State appropriations, in 1992, and \$217,926 State appropriations in 1993. Oregon State University has allocated \$153,355 state appropriations for 1994. The University of Rhode Island has not made a determination of the amount of 1994 non-federal funding for this grant.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is carried out at the University of Rhode Island and Oregon State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This phase of the program should be completed in 1997.

FLORICULTURE, HAWAII

Mr. DURBIN. Please provide a description of the research that has been funded under the floriculture program grant.

Dr. JORDAN. The research program is continuing to search for new ways of producing disease and insect free cut flowers and foliage that have high quality for export markets and the U.S. mainland. Research is being conducted on various aspects of disease control including breeding using standard techniques and genetic engineering, developing pest management programs for anthurium blight, quarantine regulations, and economic research to maintain

and expand markets. The fiscal year 1993 grant supports research through August 1994. The fiscal year 1994 grant has been requested.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The need for this research is to enhance and maintain the multimillion dollar Hawaii floriculture industries competitive position in the face of increasing competition in global and U.S. markets.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to develop superior varieties, improve productivity, reduce pest problems and improve the shipping quality of flowers sent to distant markets. Research to date has developed promising new postharvest insect treatments; progress in developing new varieties of anthurium resistant to blight; reducing nitrogen fertilizer somewhat can reduce anthurium diseases; and marketing research shows that 74 percent of the anthuriums sold in the U.S. are still grown in Hawaii.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$300,000; fiscal years 1990–1993, \$296,000 per year; and fiscal year 1994, \$278,000. A total of \$1,762,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$115,881 state in 1991; \$118,905 state in 1992; \$130,530 state in 1993; and \$129,870 state in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Hawaii-Manoa and Hilo.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that work may be completed in fiscal year 1995.

FOOD AND AGRICULTURE POLICY INSTITUTE, IOWA AND MISSOURI

Mr. DURBIN. Please provide a description of the work that has been done at the food and agriculture policy institute program.

Dr. JORDAN. The Food and Agriculture Policy Research Institute—FAPRI—was established by Iowa State University and the University of Missouri, Columbia, in 1984. The purpose of the institute is to conduct comprehensive analyses and disseminate information about the economic impacts of U.S. food, farm, and trade policies to agricultural producers, agribusinessmen, and public policymakers. Iowa State conducts research on the economic interrelationships within and between domestic and foreign food and agricultural markets from the farm gate to market destinations; develops and maintains databases and analytical support systems to facilitate the analysis of agricultural and trade policy issues; and

evaluates the impacts of U.S. and foreign commodity supply, demand, and public policy programs on agricultural trade.

The universities maintain a comprehensive analytical modeling system of the U.S. and international food and agricultural sectors to evaluate near- and long-term economic implications of alternative farm policies for the basic commodities. The system is capable of providing economic information on impacts out to 10 years in the future of farm policies on farm prices, income, output, program costs and means to enhance the management of farm programs at the national level. The fiscal year 1994 proposals have been received by CSRS and are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional, or local need for this research?

Dr. JORDAN. Much of the work conducted by FAPRI may have regional or national interest.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to develop the analytical capability to assess and evaluate U.S. farm policies on the agricultural sector and disseminate the information to farmers, agribusinessmen, and public policymakers. The mission has been expanded to include assessment of trade policy impacts and environmental programs and broadened the focus to interface with efforts to identify impacts at the regional and farm level. The models in place are also used to assess fiscal and monetary policy implications and impacts of new technologies.

Both institutions maintain large econometric models and data sets which are being updated to analyze farm and trade policy alternatives and the impacts of various programs on the several sectors of the agricultural economy. This update is being done in preparation for conducting analyses associated with developing the 1995 Farm Bill. During the past year, the Institute completed development of export models for major U.S. program crops and regional models for the soy complex, wheat, rice and feed grains. A prototype model was developed for modeling agriculture in the Former Soviet Union and Eastern Europe and is being used to assess outcomes under various scenarios. Other studies include two on the U.S. and world agricultural outlook, impacts of the proposed Btu tax on agriculture, disaster estimates from the flooding in the Midwest, rice industry analysis, budget reconciliation act impacts, haying and grazing set-aside effects, and numerous other studies.

New thrusts include development of two new baselines to complement the existing agricultural baseline used for agricultural policy analysis. These are the resource and environmental baseline and the food-nutrition-health baseline. Completion and incorporation of these baselines into the existing model framework will provide an integrated procedure to assess environmental and health policies on the agricultural and food sectors and implications of agricultural policies on the environment and public health.

Mr. DURBIN. How long has the work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1984-1985, \$450,000 per year; fiscal year

1986-1987, \$357,000 per year; fiscal year 1988, \$425,000; fiscal year 1989, \$463,000; fiscal year 1990, \$714,000; fiscal years 1991-1993, \$750,000 per year; fiscal year 1994, \$705,000. The total amount appropriated is \$6,171,000.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The program is carried out at the Center for Agriculture and Rural Development, Iowa State University and Center for National Food and Agricultural Policy, University of Missouri.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$260,355 State appropriations, \$113,565 industry, and \$37,913 miscellaneous for a total of \$411,833 in 1991; \$321,074 State appropriations, \$51,500 industry, and \$35,100 miscellaneous for a total of \$407,674 in 1992; and \$234,796 State appropriations, and \$70,378 industry for a total of \$305,174 in 1993. The University of Missouri has allocated \$75,910 in State appropriations to date for 1994. Iowa State University has not made a determination of non-federal funding amounts for 1994.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This phase of the program should be completed with enactment of the 1995 Farm Bill and related policy actions.

FOOD IRRADIATION, IOWA

Mr. DURBIN. Please provide a description of the research that has been funded under the food irradiation grant.

Dr. JORDAN. Research has been conducted on survival of pathogenic 2 microorganisms to medium-dose irradiation at various dose-rates in fresh meats, effect of packaging atmosphere on survival of pathogenic microorganisms and on product quality after irradiation at medium doses in pork, reduction of microbial contaminants by combination of medium-dose irradiation and other processes in chicken and beef products, comparison of radiation resistance of various isolates of bacterial pathogens to irradiation in beef and poultry products, and shelf-life of fresh meat products after irradiation at medium doses. In addition, studies involving irradiation of foods not of animal origin are also being conducted, specifically low-dose irradiation of strawberries for shelf-life extension, and irradiation of plant protein exudates to improve textural integrity of biodegradable plastics.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Consumers' attention and concern about the safety of fresh meat has been increased this year with the outbreaks of foodborne illness from E. coli 0157:H7.

Mr. DURBIN. What was the original goal of the research and what has been accomplished to date?

Dr. JORDAN. The original goal of the research was to generate knowledge necessary to develop a research and technology transfer program leading to commercial use of irradiation, whereby consumers would be provided with food products with enhanced safety. The effectiveness of irradiation, using an electron-beam linear ac-

celerator, in destroying known pathogenic bacteria in pork and beef has been determined. Determinations of effectiveness of combinations of irradiation and other protective technologies in destroying pathogens in food are ongoing. Demonstration of irradiation technology has been presented to some commercial firms.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal year 1991 was \$100,000. The appropriations for fiscal years 1992 and 1993 were \$237,000 per year; \$223,000 in 1994. A total of \$794,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The project received \$1,037,270 in State of Iowa funds—\$1 million of which was for capital construction—in fiscal year 1991; \$37,942 in state funds and \$67,800 in industry grants in fiscal year 1992; and \$68,897 in state funds, \$78,300 in industry grants and \$9,666 in user fees in fiscal year 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Iowa State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigator anticipates that additional Federal funding will be requested through fiscal year 1996 to complete the project.

FOOD MARKETING POLICY CENTER, CONNECTICUT

Mr. DURBIN. Please provide a description of the work that has been done under the Food Marketing Policy Center program?

Dr. JORDAN. The Food Marketing Policy Center was established in 1988 at the University of Connecticut at Storrs. The Center conducts interdisciplinary research on food and agricultural marketing and related public policy issues that influence the economic performance of the food marketing system. Emphasis is on studies of how public policies and the organization and strategies of the private sector affect industry competitiveness and the delivery of food and services, their costs, and prices. The Center works closely with the University of Massachusetts in carrying out the research program. The fiscal year 1994 proposal has been received by CSRS and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a national need to improve the economic efficiency and operation of the U.S. food marketing system for the benefit of farmers and consumers.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The Center's research goal is to identify marketing problems and assess alternatives that would improve the economic performance of the U.S. agricultural and food marketing sector and

conduct research in conjunction with the Hatch regional research project NE-165, "Private Strategies, Public Policies and Food System Performance."

The Center has completed a number of studies on food marketing including a description of food quality issues and enhancement policies, private label food brands, advertising strategies of agricultural cooperatives, an assessment of food retailing mergers and competition, evaluation of State dairy regulations, branded product marketing strategies, supermarket chain entry, oligopsony in agricultural markets, and the impact of agricultural cooperatives on food processor market performance. Also, the Center has developed analytical methods to assess market performance and sponsored several workshops on industrial organization and food safety.

The Center has implemented its comprehensive research plan with research targeted at three problem areas. They are factors shaping decisions by food firms and the consequent effects; impact assessment of public intervention on firm food safety and quality strategies; and analysis of public policies affecting competition in food markets. Studies are underway to analyze the effects of market structure on advertising activity and competitive strategies of cooperatives; restructuring strategies and dominance, and performance of food processors and retailers; food industry advertising and effectiveness; demographic analysis of food contamination; impacts of food regulation pre-emption; use of nutritional labels; firm response to food safety and nutrition regulations; and basic research on oligopoly theory.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1988, \$150,000; fiscal year 1989, \$285,000; fiscal year 1990, \$373,000; fiscal years 1991-1993, \$393,000 per year; and fiscal year 1994, \$369,000. A total of \$2,356,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$234,259 State appropriations, in 1991; \$231,741 State appropriations, in 1992; \$201,288 State appropriations, in 1993; and \$234,557 State appropriations, in 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research is being carried out by the Connecticut Agricultural Experiment Station at Storrs.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Work planned under this phase of the project is scheduled for completion with expiration of the NE-165 regional research project in 1997.

FOOD PROCESSING CENTER, NEBRASKA

Mr. DURBIN. Please provide a description of the research that has been funded under the food processing center grant.

Dr. JORDAN. The University of Nebraska Food Processing Center has been conducting short-term, highly applied research projects to assist small and mid-sized food processing companies and entre-

preneurs to develop or improve processes and products and to develop new food processing enterprises. Priorities were placed on projects relating to the safety of the food product or process and to the fulfillment of regulatory mandates such as nutrition labeling, use of approved and effective ingredients, and adherence to regulations imposed by foreign governments. In addition, several research projects were conducted to improve or assess the quality, extend the shelf-life, or assess or improve the processing efficiency of specialty food products which impacted several processors or used alternative agricultural products such as popcorn, dry edible beans, edamame soybeans, other novel legumes, and milkweed seed oil.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The primary impact of this project will be statewide. Small and mid-sized food processing companies and entrepreneurs have limited technological capabilities for addressing issues related to product development, process development, product and process evaluation, food safety, quality assurance, and regulatory mandates. The short-term research and technology transfer projects conducted as part of this overall project will aid these companies in appropriately addressing these oftentimes complicated issues.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Technological evaluations were conducted for 69 individuals or companies interested in developing new food processing businesses. Four companies were assisted with the modification of product formulation for specific export markets. Microbiological analyses were conducted for 6 mid-sized companies, including extensive shelf-life assessments for two of these companies. Sanitation audits were conducted for 6 small and mid-size companies in Nebraska. Nutritional analyses were conducted for 27 small to mid-sized Nebraska food companies who were preparing for the new nutritional labeling regulations. Short-term research projects were conducted on popcorn—relating to mold and mycotoxin formation—specialty bakery items—relating to growth of foodborne bacterial pathogens—and development of novel ingredients from dry edible beans.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992–1993 was \$50,000 per year and \$47,000 in 1994. A total of \$147,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The Food Processing Center received \$126,865 in State funds, \$356,598 from sales and fees, and \$156,580 and from food industry grants and miscellaneous sources during 1992 and 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Nebraska.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigator anticipates that research supported by fiscal year 1994 funds will be completed in 1995. One additional year of Federal funding for this project may be sought.

FOOD SYSTEMS RESEARCH GROUP, WISCONSIN

Mr. DURBIN. Please provide a description of the work that has been done under the Food Systems Research Group program.

Dr. JORDAN. The Group conducts research on issues affecting the organization and competitiveness of the U.S. food system. The factors include new technologies, market structure, and government policies and programs. Studies have been completed on feed cattle and hog pricing as influenced by changing industry structure, causes of structural change in the flour milling, soybean oil milling, wet corn milling, cottonseed milling, beef packing, and broiler processing industries. The fiscal year 1994 proposal has been submitted to CSRS and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a national need to assess and evaluate the organization and performance of the Nation's food industry to ensure that it satisfies performance expectations of farmers and consumers and adheres to acceptable standards of conduct.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The original goal was to conduct research that assesses and evaluates the organization and performance of the U.S. food industry and provide recommendations for improvements.

The Food Systems Research Group has completed numerous studies on the economic structure and performance issues about the U.S. food manufacturing and distribution system. Basic research is conducted on market theories; effects of mergers, new technologies, and firm conduct on industry structure and organization; factors affecting industry prices, profits, efficiency and progressiveness; and impact of public policies and regulations on food system organization and performance. Current research in progress includes an assessment of competition in the beef and hog industry, legal-economic analysis of competition in the procurement of cheese at the National Cheese Exchange, competition in grocery market retailing, and completion of an analysis on the structure of the food manufacturing industry.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1976-1981, \$150,000 per year; fiscal year 1982-1985, \$156,000 per year; fiscal year 1986-1989, \$148,000 per year; fiscal year 1990, \$219,000; fiscal years 1991-1993, \$261,000 per year; fiscal year 1994, \$245,000. A total of \$3,363,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$120,304 State appropriations, in 1991; \$119,448 State appropriations in 1992; and \$85,188 State appropriations in 1993. The university has not determined the allocation of 1994 non-federal funds for this project.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The grant supports a core research group at the University of Wisconsin, Madison.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The Food Systems Research Group anticipates that it can complete the existing plan-of-work by 1997 with some individual projects completed prior to that date.

FORESTRY MARKETING, VERMONT AND NEW HAMPSHIRE

Mr. DURBIN. Please provide a description of the work that has been funded under the forestry marketing program.

Dr. JORDAN. The purpose of this program is to support research to assess marketing problems and identify potential solutions affecting the forest products industry in Vermont and New Hampshire. The investigators have developed and implemented a plan-of-work. The first stage encompassed establishment of the value and potential of the Northern Forest resource base and identifying market potentials based on future opportunities. The second stage addresses direct marketing and networking of wood products in the global and domestic markets. CSRS has requested a grant proposal for fiscal year 1994 funds.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. There is a regional need to address a set of marketing problems that are preventing the forest products industry in northern Vermont and New Hampshire from reaching its potential for supporting the regional economy.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to assess and evaluate markets and devise strategies for the forest products industry of northern Vermont and New Hampshire to achieve its market potential.

The program has completed the first phase of a two phase program, estimating the resource base and market potentials. The second stage addresses development of market strategies to accomplish this task. A report has been completed and published covering the first stage.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 was \$50,000 per year; and \$47,000 in 1994. A total of \$147,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. No non-federal funds have been reported in support of this project.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is carried out by the University of Vermont.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The investigators anticipate that work will be completed in fiscal year 1994.

FORESTRY RESEARCH, ARKANSAS

Mr. DURBIN. Please provide a description of the work that has been funded under the Forestry Research grant.

Dr. JORDAN. Cooperative State Research Service has requested the university to submit a grant proposal that has been received and is under review.

This grant would fund the Center for Integrated Forest Management Strategies. Specific objectives of the Center are to develop and evaluate alternative forest management strategies for achieving multi-resource objectives on private industrial and non-industrial forestlands, and to evaluate and measure the environmental implications of forest management alternatives. This includes the impacts of intensive management practices on the biotic and abiotic environment, plus the impacts of environmental factors.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. Southern forests provide the nation with a large variety of forest resources that can be sustained in perpetuity. In addition to wood, southern forests also produce a myriad of non-timber resources which contribute to the cultural, environmental, and economic richness of the region by providing clean water, habitat for wildlife, and opportunities for hiking, hunting, camping, fishing, and other recreational activities. Because forests provide so many different resources, conflicts sometimes arise between potential land uses. There is a regional interest in pursuing research in this area.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. There are two goals of the Center. The first is to develop and evaluate alternative forest management strategies for achieving multi-resource objectives on private industrial and non-industrial forestlands. The second is to evaluate and measure the environmental implications of forest management alternatives.

Faculty members will submit project proposals for evaluation and funding. High funding priority will be given to those projects with matching funds and which systematically study components in an interdisciplinary manner. Components to be given high priority include forest productivity, environmental influences, economic and policy implications, sociology and human resources, public knowledge and awareness, and projects addressing either low-cost or environmental issues of forest management.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$470,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. During fiscal year 1993, in anticipation of work to be initiated in 1994, \$100,000 were provided by the Sturgis Foundation. During fiscal year 1994 the Sturgis Foundation provided \$10,000 and the Ross Foundation provided \$20,000.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the School of Forest Resources of the University of Arkansas at Monticello.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work may be completed in fiscal year 1998.

FRUIT AND VEGETABLE MARKET ANALYSIS, ARIZONA AND MISSOURI

Mr. DURBIN. Please provide a description of the research that has been funded under the fruit and vegetable market analysis program.

Dr. JORDAN. The purpose of this new program is to develop the analytical capability to allow improved response to requests from Congress and from other public and private interests regarding the impacts of trade, environment, and other public policies and programs. The University of Missouri and Arizona State University have submitted their initial proposals to CSRS which are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional or local need for this research?

Dr. JORDAN. The U.S. fruit and vegetable sector is experiencing increased growth from greater domestic and export demand. However, the growth of this section depends upon its ability to compete and the regulatory environment in which it operates. This program of research will provide information to farmers and policymakers on the implications and impacts of various policies and programs.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to develop the analytical capability to assess and evaluate public policies and programs impacting the U.S. fruit and vegetable industry and disseminate the results to users. Proposals have been submitted that outline long-range plans and specific projects for fiscal year 1994 funding.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$329,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funding and its source to be provided to this grant in 1994 by the University of Missouri is \$30,073 State appropriations; Arizona State University has not made a determination of the amount of non-federal funding for this grant for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The work is being carried out at Arizona State University and the University of Missouri.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work planned for this phase of the program may be completed in 1999.

GENERIC COMMODITY PROMOTION, NEW YORK

Mr. DURBIN. Please provide a description of the work that has been done under the generic commodity promotion program.

Dr. JORDAN. The purpose of this program is to assess and evaluate the economic effectiveness of generic commodity promotion programs and determine the impact of advertising up on the demand for such commodities. Many of these efforts are funded by Federal and/or state commodity check-off programs. CSRS has received the initial proposal for this program which is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. A number of the Nation's major commodity groups operate generic promotion groups using check-off funds. More commodity groups are considering this approach to increase demand for their commodities in domestic and export markets. There are national and regional needs to ascertain the effectiveness of such programs.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to determine the economic effectiveness of generic promotion programs for agricultural commodities. The researchers have developed a plan of work and submitted a proposal to CSRS.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by the grant begins in fiscal year 1994, and the appropriation of fiscal year 1994 is \$235,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Cornell University and its collaborators have not made a determination of the amount of 1994 non-federal funds to be allocated to this new project.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is being carried out at Cornell University in collaboration with Auburn University, New Mexico State University, and Texas A&M University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work planned for this phase of the program may be completed in 1999.

GLOBAL CHANGE

Mr. DURBIN. Please provide a description of the research that has been funded under the global change grant.

Dr. JORDAN. Ultraviolet, UV, radiation from the sun is damaging to many living organisms if exposed to excessive exposure. In view of well-documented reports of increased Ultraviolet radiation from Canada, the United States may also be receiving increased levels of UV radiation. Agriculture may face serious problems due to the damaging effects of UV radiation on crops, animals, and forests. People, as well as plants and other animals may be at increased risk from increased levels of UV radiation. Because the United States does not have a UV monitoring network we are uncertain of the changes in UV radiation impacting us. Cooperative State Research Service, CSRS, is in the process of setting up a network for monitoring UV-B radiation which will meet the needs of the science community of the United States, and will be compatible with measurements made in other parts of the world. The fiscal year 1993 grant supports research through June, 1994. The grant proposal for fiscal year 1994 has been requested. Funds appropriated in fiscal year 1993 are being used for network operational expansion, data analysis and acquisition, and procurement of instruments for the monitoring network.

This grant is part of a government-wide initiative. The research is closely coordinated with other Federal agencies actively involved in Global Change research.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The apparent continuing destruction of the stratospheric ozone layer, which shields the earth from the full intensity of the sun, has created a high-priority need for information regarding levels of UV radiation reaching the ground. The United States, and in fact the whole world, needs to know what levels of UV radiation are reaching the earth and impacting all forms of life.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the network is to provide highly accurate, geographically dispersed data on UV radiation to detect trends in this dangerous radiation.

Under the National Research Initiative Competitive Grants Program a grant was awarded to design and build an advanced spectroradiometer to make precise measurements of UV-B radiation. The first two of these instruments have been built, and are now being modified to correct some component weaknesses. Four additional instruments are being built with this new design. These instruments are going to be calibrated and characterized by the National Institute of Science and Technology, NIST, before installation in the field. The first two are to be installed at their field sampling sites this summer. The other four advanced spectroradiometers are to be built over the next two years. In addition, lower cost, accurate instruments are being built for the climatological network. The Smithsonian Institute has developed a filter wheel instrument in this category and six of those have been ordered. As an interim measure, to gain immediate network experience in operations, site establishment, and data management, several broadband instruments, which are less accurate and less expensive, but available "off the shelf" have been purchased and in-

stalled. The first three of these are now being operated in cooperation with the Department of Energy sites located in Illinois, Maine, and Ohio. Data are being transmitted to Colorado State University for analysis and archiving. The United States Department of Agriculture network is part of the United States Interagency In-Situ Ultraviolet Radiation monitoring Network and also cooperates with the Canadian UV network to avoid site duplication and to share knowledge.

Mr. DURBIN. How long has this work been under way and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993 was \$2,000,000 per year. The fiscal year 1994 appropriation is \$1,175,000. A total of \$5,175,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$162,253 state appropriations in 1993; and \$183,106 state appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. When established the network will include most of the country. Colorado State University is managing the operating network. The first research instrument will be installed in cooperation with the Department of Energy's Atmospheric Radiation Measurements field site at Ponca City, Oklahoma. Other research sites are under discussion. In addition, thirty climatological sites are planned for the U.S., including Hawaii, Alaska, and Puerto Rico to provide broad geographic coverage. A number of potential sites for this network have been visited by a team of scientists to determine their suitability. So far, ten sites have been selected. They are located in California, Colorado, Georgia, Illinois, Maine, Michigan, New Mexico, New York, Ohio, and Washington. Full implementation at all of these sites will be dependent on the current efforts to develop accurate low cost instrumentation.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that this network will be completed?

Dr. JORDAN. It is anticipated that this network will be an ongoing need for the nation, as with weather and climate observations. Over the next several years these measurements will provide information as to the nature and seriousness of UV radiation in the United States and will relate our conditions to the global situation.

GLOBAL MARKETING SUPPORT SERVICES, ARKANSAS

Mr. DURBIN. Please provide a description of the work that has been done under the global marketing support services program.

Dr. JORDAN. The purpose of this grant is to develop a service program to enhance global trade and develop international capabilities within the University of Arkansas. The fiscal year 1994 grant proposal has been submitted to CSRS and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. According to the proposal, the purpose of the grant is to enhance export opportunities by providing export marketing services to businesses in the area serviced by the university and develop international capabilities within the university.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to develop a service organization to support internationalization activities by local area businesses and the university. The initial proposal has been received which outlines the long-range plan and operational efforts.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$47,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$90,000 in State appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the University of Arkansas, Fayetteville?

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal researcher anticipates that the project will be completed in 1999.

GRASS SEED CROPPING SYSTEMS FOR SUSTAINABLE AGRICULTURE

Mr. DURBIN. Please provide a description of the research that has been funded under the Grass Seed Cropping Systems for Sustainable Agriculture special grant.

Dr. JORDAN. Cooperative State Research Service has requested the University of Idaho, Oregon State and Washington State Universities to submit grant proposals that have not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. According to information provided by technical committees representing researchers and the grass seed industry, the regional need for this research is to develop sustainable systems of seed production that do not depend on field burning of straw residue. Much of the grass seed for the U.S. including lawn grasses is produced in the area.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal for this project is to develop grass seed production systems that do not depend on field burning of straw residue. To date joint planning by state experiment station administrators and researchers from the three states with industry input for an integrated regional research effort to solve the problem.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$470,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This is a new project and the grant has not yet been received.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research will be conducted by the three state experiment stations in Idaho, Oregon and Washington.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 2001.

GREAT PLAINS AGRICULTURE POLICY CENTER, OKLAHOMA

Mr. DURBIN. Please provide a description of the research that has been done under the great plains agriculture policy center program.

Dr. JORDAN. The purpose of this program is to conduct research on the impact of Federal farm policies on agriculture and rural economic development in the Great Plains States. Policies to be analyzed include planting flexibility, post-Conservation Reserve Program land-use, conservation compliance, and wetlands. The investigators have collected the necessary data and are currently developing and testing the analytical models. Oklahoma State University has submitted its fiscal year 1994 proposal to CSRS, and it is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a regional need to provide timely assessments and evaluations to policymakers, farmers, community leaders, and other interested parties of the impacts of various farm policies, including the conservation reserve, wetland, conservation compliance, and cost-share assistance on farms and the rural economies of the Great Plains. Changes in these programs are expected to have significant impacts requiring farmers and rural economies to make appropriate adjustments.

Mr. DURBIN. What was original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The original goal was to conduct research on the impacts of the Federal farm programs on the Great Plains with the work being conducted jointly by Kansas and Oklahoma.

The researchers developed a plan-of-work to develop the data collection and analytical framework to carry out the purpose of this program. Analytical methods have been selected, are being developed and tested, and data collected and compiled. Plans are to complete development of the models and begin analysis this year.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992 and 1993 was \$100,000 per year, and is \$47,000 for 1994. A total of \$247,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$102,530 State appropriations, \$5,198 product sales and \$2,851 miscellaneous for a total of \$110,579 in 1992, and \$118,328 State appropriations, \$1,751 product sales and \$1,849 miscellaneous for a total of \$121,928 in 1993. No determination has been made on non-federal funding for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is begin carried out at Oklahoma State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that this phase of the program will be completed in 1996.

HUMAN NUTRITION, ARKANSAS

Mr. DURBIN. Please provide a description of the work that has been funded under the human nutrition grant in Arkansas.

Dr. JORDAN. CSRS requested the university to submit a grant proposal that is currently under review. They propose to address research on the broad area of developmental nutrition. The researchers propose to cover nutritional needs related to cognitive and intellectual development, long term consequences of children's diets, development of obesity, allergenicity of infant foods, and nutrients that augment the immune system in children.

Mr. DURBIN. According to the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses the broad areas of food quality, nutrition and optimal health. The nutritional needs of the developing rural child are far from being understood, and refining the nutrient requirements, assessing appropriate feeding techniques, and preventing life threatening diseases are important issues.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal is to learn more about the role of nutrition and the mechanisms of nutrient action on the developing human so we can make dietary recommendations to families to ensure the safety and health of children and to prevent life threatening and debilitating diseases over the life span.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 with an appropriation of \$470,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are \$396,076 from private and university sources in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the Arkansas Children's Hospital Research Institute affiliated with the University of Arkansas for Medical Sciences.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1998.

HUMAN NUTRITION, IOWA

Mr. DURBIN. Please provide a description of the work that has been funded under the human nutrition grant in Iowa.

Dr. JORDAN. Research efforts are focused on development of new foods to improve nutritional quality; to identify naturally occurring food components—protectants, toxicants and non-nutritive factors—which may improve nutritional status and decrease health risks; and to develop the means to modify consumer food selection. The ongoing research program involves 12 projects with nearly 40 senior researchers from multiple colleges and departments. Opportunities exist to affect the production of various commodities, to augment their modification and integration into new foods, and to evaluate their impact on the nutritional status of the individual and the population. The fiscal year 1993 grant supports research through March 1994. CSRS requested that the university submit a fiscal year 1994 grant proposal which is now being reviewed.

Mr. DURBIN. According to the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses the broad areas of food quality, nutrition and optimal health. The challenge is to meet nutritional goals while maintaining or enhancing the quality of the foods produced and manufactured for consumers. The results of these efforts could enhance production, provide economic benefit and complement processing needs to enhance stability and quality of foods.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The overall goal of the Center for Designing Foods to Improve Nutrition, where the grant is administered, is to promote nutritional assurance and health maintenance. Their goal is to develop an improved understanding of the bases of food selection and consumption and of nutrient utilization which will be further coordinated with production, processing and distribution of food. The additional goal of designing new food products to enhance nutritional quality of the food supply provides a unique opportunity to work with commodity groups, the food industry and health professionals to successfully achieve these goals.

A major effort supported by grant funds was to alter the fat content and composition of beef, pork, and soybeans. Pigs fed soy oil in contrast to hydrogenated oils produced higher polyunsaturated fatty acid content in the meat. Sensory evaluation of the fat-modified cooked pork cuts proved it to be acceptable, but was not as flavorful as those produced by a standard ration. Fat-modified frankfurters, bacon and pepperoni were found to be less acceptable. One research team modified the composition of soybean oils by genetic modification altering the fatty acid profiles and thus the food processing properties.

Identification and characterization of natural protectants and toxicants is another program area. Human dietary studies demonstrated that soy flavones derived from natural soy products were absorbed to the same degree as highly purified sources. In an effort to understand why individuals were reluctant to comply with dietary advice even after an adverse medical diagnosis was made, patients were found to have difficulty giving up certain foods and eat-

ing away from home adversely affected their compliance. Importantly, the study indicated that fat intake was independent consideration by the patients rather than the basis of a single attitude.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 with an appropriation of \$300,000. The fiscal years 1992-1993 appropriation was \$500,000 per year; and \$470,000 in 1994. A total of \$1,770,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$293,000 university, \$312,869 industry, and \$14,000 miscellaneous in 1991; \$90,000 state appropriations, \$473,608 university, \$131,160 industry, and \$116,560 miscellaneous in 1992; and \$307,500 state appropriations, \$472,081 university, and \$222,267 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the Center for Designing Foods to Improve Nutrition, Iowa State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that current work may be completed in fiscal year 1995.

HUMAN NUTRITION, LOUISIANA

Mr. DURBIN. Please provide a description of the work that has been funded under the human nutrition grant in Louisiana.

Dr. JORDAN. A series of studies on the differences in dietary fats is under active investigation at the Pennington Biomedical Research Center at Louisiana State University. This project consists of three different groups of studies. The first group deals with the effects of different diets on the oxidation of individual fatty acids which are found in foods or made during preparation of fats for human consumption. The second set of studies examines the effect of raising or lowering the amount of fat in the diet on the food choices and metabolic changes that people make. The final group is testing the effects of increasing the amount of fish oil in the diet on the risks for heart disease. The fiscal year 1993 grant supports research through June 1994. CSRS requested that the university submit a fiscal year 1994 grant proposal which is now being reviewed.

Mr. DURBIN. According to the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses the broad areas of food quality, nutrition and optimal health. The information about the nutritional effects of total fat and of specific fatty acids is important as the health system focuses on preventing chronic diseases.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The overall goal of this grant is to test the hypothesis that dietary fats have varying metabolic effects. To date, oxidation of 14 fatty acids has been studied in four males on a usual fat diet and the metabolism of eight fatty acids has been studied in

four males and four females on a low fat diet. Additional studies with women on the high fat diet and in subjects eating a diet with a high ratio of polyunsaturated to saturated fatty acids are underway. Metabolism of polyunsaturated fatty acids also has been studied in subjects consuming fish oil. One feeding study with supplemental fish oils has been completed and a second is underway. Studies on the effects of depleting subjects of carbohydrate on the choice of carbohydrate or fat foods have been completed, as have the studies depleting subjects of fat and measuring their intake of carbohydrate or fat foods. Studies substituting indigestible fat for digestible fat on human metabolism are currently underway.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal years 1991-1993 was \$800,000 per year; and \$752,000 in 1994. A total of \$3,152,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$523,100 state appropriations in 1991; \$515,100 state appropriations and \$2,216,606 private in 1992; \$536,100 state appropriations and \$940,000 private in 1993; and \$536,100 state appropriations and \$848,000 private in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the Pennington Biomedical Research Center, Louisiana State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be complete?

Dr. JORDAN. The university researchers anticipate that current work may be completed in fiscal year 1995.

HUMAN NUTRITION, NEW YORK

Mr. DURBIN. Please provide a description of the work that has been funded under the human nutrition grant in New York.

Dr. JORDAN. The researchers are addressing the nutritional roles of plant foods in the human diet and the impacts on the food system. Attention is being given to the potential beneficial components in plant foods; the implications of an increased reliance on plant foods by nutritionally vulnerable groups dependent upon high nutrient densities in their diet, and the issues relevant to the successful implementation of current recommendations that rely on increased consumption of plant foods. Emphasis is being given to assuring effective communication among professionals with interests in each of these areas. The fiscal year 1993 grant supports research through September 1994. CSRS has requested that the university submit a comprehensive grant proposal for fiscal year 1994.

Mr. DURBIN. According to the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses the broad areas of food quality, nutrition and optimal health. The USDA and DHHS have promulgated dietary guidelines which give greater prominence to plant foods than has been the case in the past. If these guidelines are adopted by all segments of the population to the degree that is rec-

ommended, the impact on our food system will be significant. This project aims to enhance the implementation of dietary guidelines by development of a regional food guide and to promote agricultural products of the Northeast.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The successful implementation of dietary guidelines requires that we maximize our understanding of the basis for the relationships between the increased consumption of fruits, vegetables, and other plant foods and the decreased risk of diet related chronic disease and obesity. We also need to understand how to best implement these recommendations among all income groups and the impact of their implementation on the food system in general.

The researchers have increased our understanding of the role of plant foods in human nutrition in several areas. Studies demonstrated that specific fatty acids affect the secretion of lipoprotein lipase, a key enzyme in the regulation of lipid metabolism, and that the mixture of fatty acids in plant and animal foods is key to its regulation. Another group demonstrated that the vitamin A-binding protein in the retina has two binding sites for vitamin A and that long chain fatty acids may inhibit vitamin A binding. In related studies, a systematic review of the "food system concepts" has been conducted. An integrated model which includes the roles of agriculture, food, nutrition, and health systems has been developed. The integrated model builds on the four major types of models which are most common, i.e. linear food chains, circular food cycles, networking food webs, and ecological food contexts. In addition, a theoretical model is being constructed to examine the influences of household income, food prices, and demographic characteristics on plant food consumption and nutrient intakes.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$450,000; fiscal years 1990 and 1991, \$556,000 per year; fiscal years 1992-1993, \$735,000 per year; fiscal year 1994, \$691,000. A total of \$3,723,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$154,056 state appropriations and \$2,456 private in 1991; \$238,430 state appropriations and \$60,746 private in 1992; and approximately \$19,401 state appropriations and \$22,083 private in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Cornell University, New York.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in 1999.

IMPROVED DAIRY MANAGEMENT PRACTICES, PENNSYLVANIA

Mr. DURBIN. Please provide a description of the research that has been funded under the Improved Dairy Management Practices grant.

Dr. JORDAN. The research focuses on developing methods to help dairy farmers in the adoption of new technology and management practices which lead to improved dairy farm profitability. The fiscal year 1993 grants supports research through July, 1995. The fiscal year 1994 proposal has not been received from the University.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The local need is the identification and implementation of profit enhancing management strategies for Pennsylvania dairy farms in response to changing market conditions and emerging technologies.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research remains the same, which is the development of methods to help dairy farmers in the adoption of new technology and management practices which lead to improved dairy farm profitability. A farm management survey is complete and analysis of results is in progress. Farm financial models have been developed and are undergoing field tests on selected farms. Workshops to teach elements of business management to dairy farmers have been conducted and survey instruments are in place to monitor effectiveness of workshops.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993 was \$335,000 per year. The fiscal year 1994 appropriation is \$329,000. A total of \$999,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. During fiscal year 1992, \$354,917 of State funds plus \$16,000 of Industry funds, or a total of \$370,417 non-federal funds supported this research. During fiscal year 1993, \$360,374 of State funds plus \$16,000 of Industry funds, or a total of \$376,374 non-federal funds supported this research.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Pennsylvania State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work currently underway will be completed in June, 1995.

IMPROVED FRUIT PRACTICES, MICHIGAN

Mr. DURBIN. Please provide a description of the work that has been done under the improved fruit practices grant.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received. This research will

involve a multidisciplinary approach on apple, blueberry, and sour cherry, three important Michigan fruit crops. Research will be conducted on crop management techniques and reduced chemical use.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Michigan's need for this research is to develop research to maintain/expand their tree fruit and small fruits industry.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The planned objectives of the research are to reduce the chemical contamination of the environment from fruit production through multidisciplinary research on reducing chemical usage, including pesticides, and the development of new nonchemical fruit production methods.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$494,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources to be provided for this grant in 1994 are \$437,338 state and \$135,000 from industry.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at Michigan State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1998.

INTEGRATED PEST MANAGEMENT

Mr. DURBIN. Please provide a description of the research that has been funded under the Integrated Pest Management grant.

Dr. JORDAN. Research supported by IPM competitive grants provides the science basis for alternative approaches for managing insects, diseases, weeds, and nematodes and the integration of these alternatives into IPM systems. Emphasis of the program is on enhanced natural control. In fiscal year 1993, the following categories and percentage of total resources funded were: biological control, 42.1 percent; cultural control and applied ecology, 25.8 percent; pest management integration, 13.0 percent; resistance management, 5.3 percent; host resistance, 3.5 percent; application technology, 3.4 percent; movement and dispersal of biotic agents, 3.3 percent.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. In joint testimony by the Administrators of the Environmental Protection Agency—EPA—, the Commissioner of the Food and Drug Administration—FDA—and the Deputy Secretary of Agriculture in June, 1993, a commitment was made to focus ef-

forts "... on reducing overall risks from the use of pesticides through integrated pest management programs which lead to more sustainable agricultural production strategies and reductions in the use of pesticides." The testimony further asserted that "Biocontrol systems for management and regulatory control of major plant pest and weed problems will continue to be a primary focus of USDA in its research and implementation of IPM and area-wide pest management systems." The CSRS IPM program addresses pesticide risk reduction and provides the innovation for the Administration's policy. This program supports a collective state/regional and inter-agency network for the next generation IPM. Ecologically-based IPM is being built into Sustainable Pest Management Systems that incorporate Area-wide Management, Farm Ecosystem Management, and Emerging Pest Problems. CSRS's ecologically-based IPM program has collaborative program linkages to ARS, APHIS, ES, EPA, and other agencies of USDA and government through the USDA IPM Working Group.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the CSRS IPM program is to implement alternatives to pesticides in a biologically and ecologically-based IPM system that will minimize the need for pesticide use and enhance agricultural sustainability. The following are examples of accomplishments in thrust areas of the IPM program. In the area of Biological Control, Virginia and North Carolina Agricultural Experiment Station scientists have developed the use of predators and parasites to control up to 95 percent of the filth flies in poultry houses replacing pesticides. In the area of Cultural Control, Maryland Agricultural Experiment Station scientists have determined that an alfalfa-oat intercrop system reduces the impact of leafhoppers and weeds. In Biorational Chemicals, Agricultural Experiment Station scientists from Virginia, Georgia and Texas are combining pheromones with mechanical control to hold the Southern Pine Beetle in check. This pest has caused hundreds of millions of dollars of damage to timber and pulpwood each year. In the area of Movement and Dispersal, Louisiana Agricultural Experiment Station scientists have determined the migration and invasion pattern of the velvetbean caterpillar. Knowing the source areas potentially will allow low population densities on non-host plants to be controlled with biological pesticides. In Pest Management Integration, Wisconsin Agricultural Experiment Station research and extension scientists are implementing a Potato Crop Management program which includes rotation schedules, nutrient management, disease management, irrigation schedules, and insect and weed control information.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated to CSRS as follows: fiscal year 1981, \$1,500,000; fiscal years 1982 through 1985, \$3,091,000 per year; fiscal years 1986 through 1989, \$2,940,000 per year; fiscal year 1990, \$2,903,000; fiscal year 1991, \$4,000,000; fiscal years 1992 and 1993, \$4,457,000 per year; and

fiscal year 1994, \$3,034,000. A total of \$44,475,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds for fiscal year 1991 total as follows: state appropriated—\$596,835, product sales—\$69,532, industry grants—\$40,462, and, other—\$27,644. Non-federal funds for fiscal year 1992 total as follows: state appropriated—\$565,677, product sales—\$19,106, industry grants—\$10,960, and, other—\$31,577.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being carried out in practically all of the State Agricultural Experiment Stations.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. There is a high priority for continuation of ecologically-based IPM research and for collaborative linkages with other research, extension, technology transfer, regulatory, and incentive programs to accomplish the transitions called for in the administration's policy for reducing overall risks from the use of pesticides through integrated pest management programs which lead to more sustainable agricultural production strategies and reductions in the use of pesticides.

INTEGRATED PRODUCTION SYSTEMS, OKLAHOMA

Mr. DURBIN. Please provide a description of the research that has been funded under the Integrated Production Systems, Oklahoma special grant.

Dr. JORDAN. This project focuses on the development of efficient management systems for production of watermelons and blackberries under intensively managed conditions. The work will address biotic and abiotic production components under Southeastern Oklahoma conditions for use in production guidelines. This will include planting densities, fertilizer studies, weed management, and insect and disease control.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for the research.

Dr. JORDAN. The need for this research is focused on the local area of Southeastern Oklahoma, an area that is economically depressed in need of alternative crops to diversify the dominant cow/calf livestock production.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to develop new and alternative crops to supplement and diversify the cow/calf livestock agriculture of Southeastern Oklahoma with emphasis on horticultural crops. Work to date has shown promise for strawberries, blackberries, cabbage, melons and blueberries.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Work supported by this grant started in fiscal year 1984 and the appropriations were for: fiscal year 1984, \$200,000; fiscal year 1985, \$250,000; fiscal year 1986, \$238,000; fiscal years

1987-1989, \$188,000 per year; fiscal years 1990-1991, \$186,000 per year; fiscal year 1992, \$193,000; fiscal year 1993, \$190,000; fiscal year 1994, \$179,000. A total of \$2,186,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$165,989 state appropriations in 1991; \$160,421 state appropriations in 1992; and \$164,278 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being done at the Wes Watkins Agricultural Research and Extension Center at Lane, Oklahoma, a branch of the Oklahoma State Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. The university researchers anticipate that this work will be completed in fiscal year 1997.

IOWA BIOTECHNOLOGY CONSORTIUM

Mr. DURBIN. Please provide a description of the work that has been funded under the Iowa Biotechnology Consortium grant.

Dr. JORDAN. The University of Iowa, together with the City of Cedar Rapids and Iowa State University, are conducting a joint research and demonstration project to develop and test methods to turn fermentation by-products into useful new products. The intention is to reduce the burden of waste products on municipal treatment centers from bioprocessing plants, while at the same time increasing opportunities to transform waste into commercially viable products. The specific aims of the Biotechnology By-products Consortium—BBC—involve a general model approach to the evaluation of how to handle the streams, what is economically viable for isolation and by what processes, and finally whether it is possible to use the wastes for land application, livestock feed or anaerobic fermentation to derive alternative energy sources. The 1993 grant supports research through March 1995. The 1994 grant proposal has been received and is in final stage of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The objectives of the research are to develop test methods to use fermentation of agricultural by-products to produce new products of value with the intention of reducing the burden of waste products on municipal waste systems.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research remains to conduct fundamental and applied research aimed at enhancing the recovery and utilization of by-product materials arising from new and emerging industries using biotechnology. Program emphasis is on fermentation of agricultural waste products through value added processing for economic and environmental benefits. The Consortium has made significant achievements in its work objectives. The Consortium is reaching out to establish a network of researchers

to assist them in finding uses for the by-product streams as concentrated steepwater, and to find methods to concentrate by-products for industrial uses. The Consortium is also making good progress in evaluating profitable uses of fat and carbohydrates through bioconversion, biocatalysis membrane concentration, and bioseparation. Another avenue of research has shown that land application of waste streams has considerable savings and benefits for crop production. Bioprocesses have been studied for economic significance and this information is being used to establish profitable technologies. A symposium on these emerging was organized by the Consortium and held at the 1993 American Association for the Advancement of Science meetings in Boston, Massachusetts.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$1,225,000; fiscal year 1990, \$1,593,000; fiscal year 1991, \$1,756,000; fiscal year 1992, \$1,953,000; fiscal year 1993, \$2,000,000; and fiscal year 1994, \$1,880,000. A total of \$10,407,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds and sources provided for this grant were as follows: \$623,803 from the State of Iowa, \$42,813 from the city of Cedar Rapids in 1991; \$768,287 from the State of Iowa, and \$365,813 from the city of Cedar Rapids in 1992; \$858,113 from the State of Iowa, and \$170,000 from the city of Cedar Rapids in 1993; and \$841,689 from the State of Iowa, and \$36,000 from the city of Cedar Rapids in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Iowa and Iowa State University, in collaboration with the City of Cedar Rapids.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The Consortium work plan calls for completion of all research by 1995.

INTERNATIONAL ARID LANDS CONSORTIUM

Mr. DURBIN. Please provide a description of the research that has been funded under the International Arid Lands Consortium.

Dr. JORDAN. Fiscal year 1994 is the first year the Cooperative State Research Service has funded the International Arid Lands Consortium. The Forest Service supported the program during fiscal year 1993 to develop an ecological approach to multiple-use management and sustainable use of arid and semiarid lands. Specifically, in 1993, projects addressed the propagation of selected plants for ground cover, and induced soil salinization. For 1994, the Cooperative State Research Service has requested the University of Arizona to submit a grant proposal that has not yet been received. Projects that will be funded address issues concerned with land reclamation, land use, water resources development and conservation, water quality, and inventory technologies, e.g., remote sensing.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The consortium is devoted to the development, management and reclamation of arid and semiarid lands in the United States, Israel, and elsewhere in the world. The International Arid Lands Consortium will work to achieve research and development, educational and training initiatives, and demonstration projects. The founding participants are the University of Arizona, The University of Illinois, Jewish National Fund, New Mexico State University, South Dakota State University, Texas A&I, and United States Department of Agriculture's Forest Service.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this consortium is to be acknowledged as the leading international organization supporting ecological sustainability of arid and semi-arid lands. To date, nine projects have been funded, seven of which are to conduct research and two are for a work plan and workshop.

Mr. DURBIN. The original goal of this consortium is to be acknowledged as the leading international organization supporting ecological sustainability of arid and semi-arid lands. To date, nine projects have been funded, seven of which are to conduct research and two are for a work plan and workshop.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. International Arid Lands Consortium was incorporated in 1991. Funds were appropriated to the Forest Service in 1993, and \$329,000 has been appropriated for fiscal year 1994 to the Cooperative State Research Service.

Mr. DURBIN. What is the source and amount of non-federal funds provided?

Dr. JORDAN. Members of the International Arid Lands Consortium have provided funds to support the consortium office in Tucson, Arizona and for printed materials as needed. Each member has provided travel and operations support for semi-annual meetings, teleconferences, and other related activities. In fiscal year 1993, \$59,262 were provided in state appropriations and \$84,083 by industry.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is currently being conducted at University of Arizona, South Dakota University, Texas A&I, New Mexico State, Hebrew University of Jerusalem, Ben Gurion University, and University of Illinois.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Research projects started in 1993 will be completed within 2 years and projects started in 1994 are expected to be completed within 2-3 years.

JOINTED GOATGRASS

Mr. DURBIN. Please provide a description of the research that has been funded under the Jointed Goatgrass grant.

Dr. JORDAN. The proposal calls for research on control systems for jointed goatgrass in wheat production including integrated cultural management, seed bank studies, and modeling for management.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The proposal is being planned for all of the major wheat producing areas where the jointed goatgrass is a problem. The research has a national need and will involve scientists from other states.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The objective of this project is to reduce the devastating effect of jointed goatgrass on wheat production and quality and to prevent its continued spread into new areas. Fiscal year 1994 is the first year for this project.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$329,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. No funds have been expended, as the project has not yet be awarded.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Coordinated and cooperative research will be conducted by University and USDA/ARS scientists in the states with serious infestations including Washington, Colorado, Kansas, Nebraska, Oklahoma, Utah, Oregon, and Idaho.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that the work may be completed in fiscal year 1999.

LIVESTOCK AND DAIRY POLICY, NEW YORK AND TEXAS

Mr. DURBIN. Please provide a description of the work that has been done under the livestock and dairy policy program grant?

Dr. JORDAN. The purpose of this grant is to assess the possible economic impacts on the U.S. livestock, poultry, and dairy sectors from various macroeconomic, farm, environmental, and trade policies and new technologies. Both institutions conduct analyses of these policies and disseminate the information to policymakers, farmers, and agribusinessmen. The fiscal year 1993 grant to Texas A&M University supports the livestock research program through February 1994. The fiscal year 1993 grant to Cornell University supports the dairy policy research program through August 1994. Both universities have submitted their fiscal year 1994 grant proposals which are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. Information on the implications of new and alternative farm, trade, and macroeconomic policies affecting the livestock and dairy sectors is of general interest to officials, farmers and others. Such information enables farmers and agribusinessmen to make necessary adjustments to their operations and for public officials to consider alternatives.

Mr. DURBIN. What was the original goal of this research and what has been done to date?

Dr. JORDAN. The original goal was to establish a specialized research program that could provide timely and comprehensive analyses of numerous policy and technological changes affecting farmers and agribusinessmen and advise them and policymakers promptly of possible outcomes. The capability to achieve this goal has been achieved. This program continues to provide assessments of provisions and proposed changes in the 1990 Food, Agriculture, Conservation, and Trade Act and evaluations of the General Agreement on Tariffs and Trade and the North American Free Trade Agreement, various income and excise tax measures, alternative pricing measures for milk, and the bovine growth hormone. Both institutions maintain extensive outreach programs to disseminate results throughout the United States. The program has updated its analytical capability to commence analysis of proposals for the forthcoming 1995 Farm Bill.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$450,000; fiscal year 1990, \$518,000; fiscal years 1991-1993 \$525,000 per year; fiscal year 1994, \$494,000. A total of \$3,037,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$37,420 State appropriations in 1991; \$162,086 State appropriations and \$133,278 product sales in 1992; and \$301,817 State appropriations, \$1,412 industry, and \$7,121 miscellaneous for a total of \$310,350 in 1993. New York has designated the following amounts for fiscal year 1994: \$24,702 State appropriations, and \$5,961 industry for a total of \$30,663. Texas has not determined the amounts of non-federal matching amounts for 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at Cornell University and Texas A&M University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This phase of the program should be completed with enactment and review of the 1995 Farm Bill and related trade policy measures.

LOWBUSH BLUEBERRY RESEARCH, MAINE

Mr. DURBIN. Please provide a description of the research that has been funded under the lowbush blueberry research program grant.

Dr. JORDAN. Interdisciplinary research is being conducted on many aspects of lowbush blueberry culture and marketing including irrigation, fertilization, postharvest methodology, pests and fruit bud cold hardiness. The fiscal year 1993 grant supports research through September 1994. The fiscal year 1994 grant proposal has been received and is being processed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Since Maine produces the majority of the lowbush blueberries grown in the U.S., this work is of local interest.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original research goal was to provide research answers to the numerous industry production, pest and postharvest fruit problems. Research to date indicates that berries from irrigated plots were larger and softer, the amount of cold weather blueberry flower buds can withstand has been determined. A new method has been devised to apply herbicides that reduces injury to blueberry plants. Boron and phosphorus can increase yields. Potassium may increase winter hardiness of lowbush blueberry plants, alfalfa leafhopper bees can improve the pollination and yields of blueberries, and chlorinated wash water reduces postharvest fruit spoilage.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1990, \$170,000; fiscal year 1991, \$202,000; fiscal years 1992 and 1993, \$185,000 per year, and fiscal year 1994, \$208,000. A total of \$950,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$48,919 state, \$55,980 industry in 1991; \$51,071 state, \$48,654 industry in 1992; \$56,493 state, \$60,885 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Maine.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work may be completed in fiscal year 1995.

LOW INPUT AGRICULTURE, MINNESOTA

Mr. DURBIN. Please provide a description of the research that has been funded under the Low-Input Agriculture Minnesota grant.

Dr. JORDAN. This project continued research in fiscal year 1993 on soil-specific management of nitrogen and denitrification inhibitors to lower or optimize use of nitrogen fertilizer; on changing plant population of corn on-the-go to match soil productivity and increase net returns; and on varying surface crop residue cover by

soil and landscape conditions to control soil erosion and runoff of agrichemicals, and to sustain productivity.

New studies were started in 1993 to determine the benefits of changing seed variety within fields to match specific soil conditions. The purpose is to increase productivity and lower agrichemical inputs by selecting varieties more resistant to diseases for areas of fields that are infected.

A technology transfer effort of results from this research was initiated in 1993, in cooperation with University of Minnesota Extension soil scientists, and with funding from the agricultural industry. Activities include field demonstrations, workshops, video tape production, and preparation of educational material. The agricultural industry provided matching funds for this initiative.

The fiscal year 1993 grant supports this research through June 1995. The research proposal for fiscal year 1994 is being reviewed by the Cooperative State Research Service.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Concern over the increasing use of agricultural chemicals and for the possible movement of these chemicals into surface and ground water has resulted in increased need for low-input agricultural systems. Given the site-specific nature of much low-input research, this program will generally meet local needs.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original overall goal of this research is to understand and model soil properties that relate to spatial variability in the agricultural ecosystem to optimize soil management.

In 1993, the extremely wet and cool conditions in Minnesota drastically affected experiments. In some cases, the corn crop was destroyed or corn yields could not be collected. However, these extreme conditions highlighted differences in crop growth due to soil variability within fields, and the potential benefit of soil-specific management. These conditions also demonstrated the need to consider changes over time as well as over fields to optimize inputs and soil-specific management practices. Still, a significant response of corn yields to nitrogen fertilizer rate was measured when averaged across soil types. Soybean yields were observed to differ significantly with different tillage and crop residue management systems in well-drained field areas. Crops were destroyed in poorly drained areas. The lowest yielding tillage system was the treatment with the highest level of crop residues.

In other studies, both plant population and corn seed hybrid had a significant effect on corn yield across soil types, with one hybrid yielding over 10 bushels per acre higher than another in the study. Matching funds were obtained in 1993 from the agricultural equipment industry to support this research.

Another significant result from the work done under this project has been the creation of a North Central Regional Research Project, NCR-180, "Site-Specific Management", to coordinate research among the State Agricultural Experiment Station scientists in this developing research and development area. Furthermore, two brochures were prepared summarizing the status of site-spe-

cific management in regard to spatial variability, management, engineering, profitability, environment, and technology transfer. One brochure was written for decision makers and researchers, and the second one for producers.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1988 and 1989, \$100,000 per year; fiscal year 1990, \$148,000; fiscal year 1991, \$174,000; fiscal years 1992-1993, \$230,000 per year; fiscal year 1994, \$216,000. A total of \$1,198,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$31,841 state appropriations, \$2,380 industry, \$13,489 miscellaneous in 1991; and \$10,614 state appropriations, \$793 industry, and \$4,497 miscellaneous in 1992. The information on non-federal funds and sources for fiscal years 1993 and 1994 is not yet available from the University of Minnesota.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted by the Department of Soil Science at the Minnesota Agricultural Experiment Station, University of Minnesota.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated the work may be completed in fiscal year 1995.

MAPLE RESEARCH, VERMONT

Mr. DURBIN. Please provide a description of the work that has been funded under the maple research grant.

Dr. JORDAN. The focus of this program of research is on the effects of fertilization on declining maple trees. Prior efforts concentrated on the water stress physiology of maple trees with the goal of learning how water moved from soil to roots, through the tree affecting growth and production of sap. Acid rain was investigated as a possible cause of some of the problems maple trees were experiencing. The fiscal year 1993 grant supports research through June 1994. The fiscal year 1994 grant proposal has not been received yet.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. For several years the maple industry in the Northeast has been concerned about the decline and dieback of sugar maple trees. Identification of the causes of these problems and the practices to reverse them are of major economic concern throughout New England and eastern Canada. Fertilization has been practiced by some maple producers for years, but rigorous evaluation of the effectiveness of this practice has not been made. This research program is designed to evaluate the fertilizer practices and to study several aspect of maple physiology related to the maple industry.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was, and is, to conduct research on the physiology and management of sugar maple stands to benefit the maple industry in Vermont and the Northeast.

During the last year the maple nutrition program accomplished a major data analysis. Significant trends appeared when maximum photosynthesis and level of nutrients were examined. Maximum net photosynthesis is positively correlated with leaf nitrogen, and to a lesser extent with leaf calcium and magnesium contents. Studies of roots in soil cores taken in the research area revealed that declining stands have a higher content of dead fine roots. These findings are consistent with previous research.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, \$100,000; fiscal years 1986 and 1987, \$95,000 per year; fiscal years 1988 and 1989, \$100,000 per year; fiscal years 1990-1993, \$99,000 per year; fiscal year 1994, \$93,000. A total of \$979,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$52,200 state appropriations, and \$10,345 product sales in 1991; \$49,450 state appropriations, and \$18,950 product sales in 1992; and \$49,575 state appropriation, and \$23,860 product sales in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Vermont Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Research planned for fiscal year 1994 involves the mechanism of maple sap exudation and root physiology. It is anticipated that this work may be completed in 1998.

MICHIGAN BIOTECHNOLOGY INSTITUTE

Mr. DURBIN. Please provide a description of the work that has been funded under the Michigan Biotechnology Institute grant.

Dr. JORDAN. The objective of the Michigan Biotechnology Institute's research program is to develop bioprocessing technology to manufacture products from agricultural raw materials. In this context, bioprocessing may include a fermentation, an enzymatic step, chemical catalysis, or physical modification of agricultural raw materials. The fiscal year 1993 grant supports research through January 1994. The 1994 grant proposal has been received and is in the final stages of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The objective of this research is to develop bioprocess technology to manufacture products from agricultural

raw materials, thereby increasing their utilization and reducing agricultural commodity surpluses.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research remains to provide a return on the investment by choosing market-viable technologies developed through new companies, new jobs, and additional tax revenues produced for state, local, and federal governments. Michigan Biotechnology Institute has succeeded in developing a number of bioprocesses to produce chemicals: food ingredients, polymeric materials, and industrial feed stocks in the four focus areas that make up the Institute's overall program for bioprocessing of agricultural raw materials. The food ingredients include a no sodium or potassium salt substitute. Michigan Biotechnology Institute has developed new formulations for bio-based solvents, a natural cherry flavor, natural succinic acid from corn by fermentation and dietary fibers from modified corn bran. Polymeric materials include biodegradable starches that can be used in injection molding and cast film extrusion and biodegradable zein products that can be used as coatings to paper, that are still recycled. Michigan Biotechnology Institute has also been developing biocomposites that can be injection molded, such as materials using waste wood and pecan shells. Biocatalytic processes include a demonstrated method for improved glucose manufacturing and thermal stable cellulose. Many of these products are being explored for commercial development through licensing agreements with industrial partners.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1993?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$1,750,000; fiscal year 1990, \$2,160,000; fiscal year 1991, \$2,246,000; fiscal years 1992-1993, \$2,358,000 per year; and fiscal year 1994, \$2,217,000. A total of \$13,089,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$1,750,000 State of Michigan appropriations, \$160,000 from industry, and \$1,000,000 from miscellaneous in 1991; \$1,750,000 in State of Michigan appropriations, \$175,000 from industry and \$1,000,000 in miscellaneous in 1992; \$1,750,000 as State of Michigan appropriations, and \$100,000 from industry in 1993—there was no Kellogg Foundation grant that year; and \$1,750,000 in State of Michigan appropriations, \$175,000 from industry and \$100,000 miscellaneous in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted on the campus of Michigan State University at the Michigan Biotechnology Institute.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The Institute has reported specific milestones that they intend to accomplish within the five year period ending in fiscal year 1995. Michigan Biotechnology Institute has kept to that timetable and it's anticipated that they will be able to complete the work on schedule.

MIDWEST ADVANCED FOOD MANUFACTURING ALLIANCE, NEBRASKA

Mr. DURBIN. Please provide a description of the research that has been funded under the Midwest advanced food manufacturing alliance grant.

Dr. JORDAN. The stated purpose of the Midwest Advanced Food Manufacturing Alliance is to expedite the development of new manufacturing and processing technologies for food and related products derived from U.S. produced crops and livestock. The Alliance will be formed between research scientists in food science and technology, food engineering, nutrition, microbiology, computer sciences, and other relevant areas from 13 leading Midwestern universities and private sector researchers from numerous U.S. food processing companies. Specific research projects will be awarded on a competitive basis to university scientists with matching funds from non-federal sources for research involving the processing, packaging, storage, and transportation of food products.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The food manufacturing industry is the number one manufacturing industry in the United States. Opportunities for trade in high value processed food products will grow exponentially on a worldwide basis.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Since this is a newly funded project, no progress has been reported.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$470,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The competitively awarded research projects funded by the Alliance will require a minimum of a 1:1 match of funding from the food industry, industry trade associations, or state appropriations. In addition, the thirteen universities involved in the partnership have sizeable amounts of state, industry, and other funds for the support of related research projects.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. Research will be conducted at the partner universities who receive awards through the Alliance's competitive peer-review process.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. A completion date has not been determined.

MIDWEST AGRICULTURAL PRODUCTS, IOWA

Mr. DURBIN. Please provide a description of the work that has been done under the Midwest agricultural products program.

Dr. JORDAN. Applied research is conducted to improve the competitiveness and marketability of agricultural sector products pro-

duced in the Midwest and disseminate the results to agribusinessmen. Programs have been initiated on trade and market analysis, agribusiness trade initiatives, and dissemination of research. Iowa State University has submitted its fiscal year 1994 grant proposal to CSRS, and it is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a need by small- and medium-sized agribusinessmen in the Midwest region for trade expansion market research to enable them to realize the export market potential for their products.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to enhance the export of Midwest agricultural commodities and value-added products through research and information transfer programs utilizing a close working relationship with these firms.

This program has completed major studies on meat marketing in the former Soviet Union states and Singapore, soybean product markets in Japan, an update on world food trade and U.S. agriculture, and an update on the General Agreement on Tariffs and Trade negotiations. Emphasis is now being placed on markets in Latin America, Africa, and the Baltic States. Country and business profile studies are being undertaken to improve the development of trade relationships between firms in these countries and Midwestern firms. Market information is compiled and made available to Midwestern agribusiness firms by electronic media, workshops, and publications. Similar information about Midwestern firms is made available to overseas counterparts.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 is \$700,000 per year; and fiscal year 1994, \$658,000. A total of \$2,058,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$185,495 State appropriations and \$373,897 industry for a total of \$559,392 in 1992; \$183,192 State appropriations and \$318,966 industry for a total of \$502,158 in 1993. No determination has been made by Iowa State University regarding non-federal support for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The program is carried out by Iowa State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This current phase of the program may be completed in 1997.

MIDWEST PLANT BIOTECHNOLOGY CONSORTIUM

Mr. DURBIN. Please provide a description of the work that has been funded under the Midwest Plant Biotechnology Consortium grant.

Dr. JORDAN. The purpose of the Midwest Plant Biotechnology Consortium is to foster and facilitate promising basic research investigations that will lead to industrial applications. Through the Midwest Plant Biotechnology Consortium, universities, Federal laboratories, and company collaborators conduct research in plant biotechnology in efforts to: utilize agricultural products as new sources of chemicals, pharmaceuticals, and energy; reduce the cost of agricultural production; improve utilization of existing crops; and develop safe environmental practices. The fiscal year 1993 grant supports research through April 1994. A grant proposal was requested for fiscal year 1994, but has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researchers, what is the national, regional or local need for this research?

Dr. JORDAN. The Consortium's activities are directed at national and regional needs to increase the value of U.S. agricultural exports by more effectively harnessing available expertise in the plant sciences to address national strategic goals.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the Midwest Plant Biotechnology Consortium remains to discover and apply technologies that will better utilize agricultural products; increase the efficiency of current agricultural systems; find new uses of existing agricultural products; and develop safe environmental practices. The Consortium solicits—through a mechanism of pre-proposals—full proposals that are then peer reviewed to identify 20 or more projects to be carried out at participating universities. Ongoing projects have focused on the application of biotechnology tools for improving major U.S. agricultural crops using genetic transformation systems. Researchers funded through the Consortium have identified genes controlling protein biosynthesis, sources of resistance to crop disease and genetically conditioned factors contributing to crop yield. In addition, consortium genomic mapping of corn projects have contributed to better scientific understanding of traits of agricultural importance.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$1,750,000; fiscal year 1990, \$2,529,000; fiscal year 1991, \$2,730,000; fiscal years 1992–1993, \$2,865,000 per year; fiscal year 1994, \$2,693,000. A total of \$15,495,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$1,126,554 from industry and \$1,386,566 miscellaneous in 1991; \$1,022,822 from industry and \$1,118,503 miscellaneous in 1992; and \$477,627 from industry and \$770,065

miscellaneous in 1993. Please note that the 1993 numbers will still increase as awards are being made under that appropriation and the 1994 awards are now just beginning and thus there are no non-federal funds to report at this time.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by members of the Consortium which is comprised of ten Land-Grant institutions and six associated universities located throughout the North Central States.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Purdue University, the management institution for the consortium, has stated its intention to submit a new five year plan that would end in fiscal year 1998.

MIDWEST FEEDS CONSORTIUM

Mr. DURBIN. Please provide a description of the work that has been done under the Midwest Feeds Consortium grant.

Dr. JORDAN. Fiscal year 1994 represents the first year of this grant program. The researchers involved indicate that the consortium will focus on the development of aquacultural feeds aimed at reducing the industries dependence on marine protein meals.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. At present, many aquacultural feeds contain expensive marine proteins, such as fish meal. The researchers indicate that there is a need to replace imported marine proteins with grain, oilseed, and animal by-product based protein meals common to the U.S. Midwest. Replacement of expensive marine protein meals could reduce the U.S. dependence on foreign imports and could lead to the export of domestically produced plant and animal by-product protein meals.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to develop aquacultural feeds that use plant and animal by-product protein meals common to the U.S. Midwest to replace expensive marine protein meals.

Mr. DURBIN. How long has this research been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$470,000.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work will be carried out through a grant to Iowa State University in cooperation with the Oceanic Institute of Hawaii. Additional consortium members will be added as the program is developed.

Mr. DURBIN. What has been accomplished to date?

Dr. JORDAN. Fiscal year 1994 represents the first year of the study and the program is currently in the planning and development stage.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work will be completed in fiscal year 1997.

MILK SAFETY, PENNSYLVANIA

Mr. DURBIN. Please provide a description of the research that has been funded under the milk safety program grant.

Dr. JORDAN. Research has been conducted to determine the mechanisms of growth and control of two important food-borne bacterial pathogens, *Staphylococcus aureus* and *Listeria monocytogenes*. Both pathogens have been responsible for several major outbreaks of foodborne illness traced to dairy products. Researchers have also examined consumers—especially feeding program administrators and parents of young children—awareness, concern, and experience with foodborne diseases and chemical contamination in milk and other dairy products have examined the effect of these parameters on dairy product purchases.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. *Staphylococcus aureus* is estimated to be responsible for approximately 30 percent of the total foodborne illness in the United States. Dairy products such as milk, non-fat dry milk, cheese, butter, and cream have been associated with several large outbreaks of staphylococcal food poisoning. This organism is also a frequent cause of bovine mastitis. Not only can staphylococcal infections of dairy cattle lead to a greater risk of staphylococcal food poisoning, but these infections may also cause a drastic reduction in milk production. Several outbreaks of food poisoning linked with *Listeria monocytogenes* have been associated with the consumption of pasteurized dairy products. The fatality rate of this latter foodborne illness is approximately 30 percent. Thus, the need for this research may exist at the local and regional level, as well as nationally.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The research is aimed at minimizing or eliminating future foodborne disease outbreaks from milk and dairy products. This is particularly important for Pennsylvania the fourth largest milk producing state in the U.S. The researchers have discovered that *Listeria monocytogenes* may survive pasteurization under certain circumstances. A technique was developed for isolation and evaluation of antimicrobial agents which inhibit this pathogen. A key gene has been identified which is believed to be important for the growth of *Staphylococcus aureus*. New methods are being developed to rapidly and sensitively detect the presence of these bacteria, including those that may be injured and regenerate, in dairy products. Furthermore, an immunization approach is being developed to prevent the contamination of dairy cattle with these bacteria. Researchers have also discovered that conventional public opinion survey questions asking how concerned the public is with food safety may lead to an over-estimation of their actual concern. They found that parents reacted equally negatively to negligence in handling a contamination incident, whether it was bacterial or chemical. Over 60 percent of respondents were willing to pay more

for safer milk, most willing to pay up to 30 cents more per half gallon.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Mr. JORDAN. Grants have been awarded for milk consumption and milk safety from funds appropriated as follows: fiscal years 1986 through 1989, \$285,000 per year; fiscal year 1990, \$281,000; fiscal year 1991, \$283,000; fiscal year 1992, \$284,000; fiscal year 1993, \$184,000; and fiscal year 1994, \$268,000. A total of \$1,019,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The University estimates that non-federal funds contributed to this project include the following costs and salaries: \$256,000 for fiscal year 1991; \$224,700 for fiscal year 1992; and \$142,600 for fiscal year 1993.

Mr. DURBIN. Where is the working being carried out?

Dr. JORDAN. This research is being conducted at the Pennsylvania State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that research should be concluded on this project in 1996.

MINOR USE ANIMAL DRUGS

Mr. DURBIN. Please provide a description of the research that has been funded under the minor use animal drug program grant.

Dr. JORDAN. In 1982, Interregional Research Project Number 4—IR-4— was expanded to include efforts to obtain FDA clearance of animal drugs intended for use in minor species and for minor uses in major species. In 1993, a separate research project for minor use animal drugs was established. A new project entitled "NRSP-7 A National Agricultural Program to Approve Animal Drugs for Minor Species and Uses", replaced the IR-4 Minor Use Animal Drug Program. Special research grant funds are divided between the four regional animal drug coordinators and the headquarters at Michigan State University for support of the drug clearance program. These funds are being utilized by the regional animal drug coordinators and by allocation to State Agricultural Experiment Stations—SAES—to develop data required for meeting clearance requirements. Participants in the research program consist of the regional coordinators, SAES, ARS, USDI Fish and Wildlife Service, schools of veterinary medicine, and the drug industry. Each year priorities are established for the various species categories including small ruminants, game birds, fur-bearing animals, and aquaculture species. The fiscal year 1993 grants terminate between February 1994 and September 1995. The fiscal year 1994 grants have been received and are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Animal agriculture throughout the U.S. has relied on chemical and pharmaceutical companies to provide their indus-

try with safe, efficacious drugs to combat diseases. The need for FDA/CVM approved drugs to control diseases in minor species and for minor uses in major species has increased with intensified production units and consumer demand for residue-free meat and animal products. The high cost incurred to obtain data required by federal, regional, and local regulations to approve these drugs, when coupled with limited economic returns, has limited the availability of approved drugs for minor uses and minor species. The program provides research needed to develop and ultimately culminate in drug approval by FDA/CVM for the above purposes. The goals are accomplished through the use of regional animal drug coordinators as well as a national coordinator to prioritize the need, secure investigators at federal, state and private institutions, and oversee the research and data compilation necessary to meet federal regulations for approval. All drug approvals are national, although industry use may be regional. For example aquaculture is concentrated in specific geographic sections of the country.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal to obtain FDA clearance of animal drugs intended for use in minor species and for minor uses in major species remains as the dominant goal. In recent years, the research program has expanded or given additional emphasis to aquaculture species, veal calves and sheep. The importance of environmental assessment, residue withdrawals and occupational safety have increasingly been given more attention during the approval process to help assure consumer protection. To date, 248 drug requests have been submitted to the Minor Use Animal Drug Program for clearance. Working in conjunction with many universities, the USDI Fish and Wildlife Service, ARS and numerous pharmaceutical companies, 28 research projects are now active and will be continued through 1994 to establish data for clearances. Twenty public master files, which involve 10 animal species, have been published in the Federal Register providing clearance for drug use in minor species. Nine additional public master files are currently being reviewed.

The Center for Veterinary Medicine of the Food and Drug Administration is cooperating and supporting this program to the fullest extent. The program is a prime example of Federal interagency cooperation in coordination with academic institutions, pharmaceutical industries and commodity interests to effectively meet an urgent need.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from appropriated funds in the amount of \$240,000 per year for fiscal years 1982-85; \$229,000 per year for fiscal years 1986-1989; \$226,000 for fiscal year 1990; \$450,000 for fiscal year 1991; \$464,000 per year for fiscal years 1992 and 1993; and \$611,000 for fiscal year 1994. A total of \$4,091,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$156,099 state appropriations, \$29,409 industry, and \$11,365 miscellaneous in 1991; \$265,523 state appropriations, \$1,182 product sales, \$10,805 industry, and \$59 miscellaneous in 1992; \$212,004 state appropriations, \$315 industry; and \$103 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the four regional animal drug coordinators located at Cornell University, the University of Florida, Michigan State University and the University of California-Davis, and to program Headquarters at Michigan State University. Research is conducted at these universities and through allocation of these funds for specific experiments at the State Agricultural Experiment Stations, the Agricultural Research Service, the USDI Fish and Wildlife Service and in conjunction with several pharmaceutical companies.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Selected categories of the Special Research Grants program address important national/regional research initiatives. Research projects for this program have involved 20 different animal and aquaculture species with emphasis given in recent years to research on drugs for the expending aquaculture industry. The minor use animal drugs program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. Especially with the new sensitivities about safety and the environment, there is a high priority for continuation of these ongoing projects.

MULTI-COMMODITY RESEARCH, OREGON

Mr. DURBIN. Please provide a description of the work that has been done under the multi-commodity research program.

Dr. JORDAN. The purpose of the program is to provide agricultural marketing research and analysis to support producers and agribusinessmen in penetrating new and expanding markets in the Pacific rim. CSRS has requested Oregon State University to submit a grant proposal for fiscal year 1994 that has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The Pacific Northwest region producers a wide variety of agricultural commodities and products with considerable potential for export to Pacific Rim countries. Research and analysis would assist regional producers and processors in assessing these markets and developing market strategies.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to support a research program on the marketing of wheat and other commodities.

Several projects have been initiated on wheat marketing and development of a data collection and analysis program to estimate the export potential of specialty crops and products therefrom. The researchers are in the process of developing a long-range strategic

plan and operating plans to direct future efforts on high priority needs and identify resource needs.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The research began in fiscal year 1993 with an appropriation of \$300,000. The 1994 appropriation is \$282,000 for a total of \$582,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funding provided for this grant was \$168,824 in State appropriations in 1992, and \$177,574 in State appropriations in 1993. The university has allocated \$162,394 in State appropriations for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program will be carried out at Oregon State University and the Wheat Marketing Center in Portland.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. No completion date has been provided pending completion of the strategic research plan.

MULTI-CROPPING STRATEGIES FOR ACQUACULTURE, HAWAII

Mr. DURBIN. Please provide a description of the research funded under the multi-cropping strategies for aquaculture research grant in Hawaii.

Dr. JORDAN. In fiscal year 1993, the university changed the focus of this research program to address the opportunities of aquaculture production in the ancient Hawaiian fish ponds. The university has developed a community-based research identification process and is currently developing specific research projects to be included in this program. Previous research under this program led to the development of coproduction of shrimp and oysters in aquacultural systems. The technology developed from this program has been commercialized. The fiscal year 1993 grant supports research through July of 1995. The fiscal year 1994 grant proposal has been requested out has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The researchers indicate that the primary need for this research is to assist the native Hawaiians in improving the profitability and sustainability of the ancient Hawaiian fish ponds as part of a total community development program.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this program was to develop technology for coproduction of shrimp and oysters in aquacultural production systems. Research has led to the development of production systems that have been field tested under commercial conditions. Oyster production systems have been developed that utilize waste from shrimp production systems and produce an additional high value crop.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. This research was initiated in fiscal year 1987 and \$152,000 per year was appropriated in fiscal years 1987 through 1989. The fiscal year 1990–1993 appropriations were \$150,000 per year, and \$141,000 in 1994. A total of \$1,197,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The university reports a total of \$137,286 of non-federal funding for this program in fiscal years 1991–1994. The primary source of non-federal funding was from state sources.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Hawaii.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers have indicated that all of the initial research objectives have been completed under the support provided through fiscal year 1992. The university has indicated that they would like to initiate a complete new research program with funding provided starting in fiscal year 1993 with the work to be completed in fiscal year 1996.

NATIONAL BIOLOGICAL IMPACT ASSESSMENT PROGRAM

Mr. DURBIN. Please provide a description of the work that has been funded under the National Biological Impact Assessment Program grant.

Dr. JORDAN. The National Biological Impact Assessment Program's mission is to facilitate and assess the safe application of new technologies for the genetic modification of plants, animals, and microorganisms to benefit agriculture and the environment. The fiscal year 1993 grant supports research through June 1994. The fiscal year 1994 grant proposal has been received and is in the final stage of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The National Biological Impact Assessment Program information system for biotechnology provides important and timely access to information for U.S. researchers via an electronic highway. The program's bulletin board is the official source for public information concerning the Animal and Plant Health Inspection Service's field test notification procedure and it carries important Federal policy statements, guidelines, and regulations to the research community nationwide. The Program also provides biosafety training through workshops for academic and corporate scientists, biosafety officers, and state regulators. These workshops are intended to assist individuals and institutions in complying with federal regulations that assure the safety of biotechnology research conducted outside of containment.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the National Biological Impact Assessment Program remains to provide easy access to national information on public health and environmental safety of agricultural

biotechnology research. Its stated objectives were to increase the availability, timeliness, and utility of information exchange within the biotechnology research community; facilitate the preparation of proposals by scientists to comply with the oversight and regulatory requirements for testing potential biotechnology products; and support for the national research community with services and resources that would foster the safe application of biotechnology to agriculture and the environment. Within the past year the program has expanded access to the electronic bulletin board system which services 7,000 system users seeking information on the safe applications of biotechnology to agriculture and the environment. The program also improved its databases for more rapid access and reduced information transmission costs. The National Biological Impact Assessment Program updated its permit application software which facilitates the design for safe experiments and the drafting of applications for federal permit to conduct field tests with genetically modified organisms. The National Biological Impact Assessment Program supported research in risk assessment and completed development of a biological monitoring database of Environmental Assessments derived from the U.S. Department of Agriculture field test permit approvals. This data base was released on a Compact Disk Read only Memory—CD-ROM—.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$125,000; fiscal year 1990, \$123,000; fiscal years 1991–1993, \$300,000 per year; and fiscal year 1994, \$282,000. A total of \$1,430,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The co-principal investigator of this grant is Head of the Department of Biochemistry and Anaerobic Microbiology at Virginia Tech and approximately \$5,000 of his salary is provided by the University to administer this grant.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The program coordination is being provided by the Virginia Polytechnic Institute and State University. Former and current partners in the program include The Pennsylvania State University, Louisiana State University, North Carolina Biotechnology Center, University of Arizona, University of Missouri, Michigan State University, Purdue University, and the National Agricultural Library.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed.

Dr. JORDAN. There remains a continuing need to address the safety of field testing of genetically modified organisms with respect to agriculture and the environment. This program has been very successful in providing essential information on the conduct of safe field experiments, and thus the program remains a high priority and will need to be extended beyond the initially planned five years.

NEMATODE RESISTANCE GENETIC ENGINEERING, NEW MEXICO

Mr. DURBIN. Please provide a description of the work that has been funded under the Nematode Resistance Genetic Engineering Project grant.

Dr. JORDAN. This research project is exploring alternatives to pesticides. The intent is to decrease or eliminate the current reliance on soil-applied pesticides which are now or are likely to become significant contaminants of ground water. The research involves creating resistance to nematodes within the plants themselves by utilizing qualities from various predacious fungi and mammalian sources, and to transfer the genetic information required for predation to crops. The fiscal year 1993 grant supports research through September 1994. The fiscal year 1994 proposal is in the final stages of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The Nematode Resistance Genetic Engineering Project is designed to provide an environmentally-sound, specifically-targeted, and biotechnologically-advanced way of combating nematode infestations of agronomically valuable crop plants with the potential for both regional and national application. Nematodes cause \$77 billion in worldwide crop losses annually, and they attack quickly all vegetable and field crops. Although nematodes occur worldwide, the greatest damage in agriculture is associated with areas with mild winters such as the southwest U.S. where the soils do not freeze. Current nematode control practices consist mainly of crop chemical nematicides which are considered undesirable because of associated ground water contamination problems. Genetically engineered crops with nematode resistance offers great promise.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this project remains to provide an alternative approach for the control of plant parasitic nematodes through the use of molecular biological techniques for the transfer of nematocidal resistance capacities directly to plants. The project has successfully inserted the collagenase gene into plants and bioassays have demonstrated activity of the resistance against plant parasitic nematodes. The feasibility of this innovative, genetic engineering approach is now being tested.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal years 1991-1993 was \$150,000 per year; and \$141,000 in 1994. A total of \$591,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$65,000 state appropriations in 1991; \$65,000 state appropriations in 1992; \$75,000 in state appropriations in 1993; and \$75,000 state appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the New Mexico State University, and at collaborating universities in the region.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The Program has indicated that the objectives will be completed by fiscal year 1996.

NEW METHODS OF WEED CONTROL, NORTH DAKOTA

Mr. DURBIN. Please provide a description of the research that has been funded under the New Methods of Weed Control, North Dakota grant.

Dr. JORDAN. The project is designed to reduce the environmental pollution caused by the extensive usage of herbicides for weed control and provide growers with environmentally safe weed control systems. The present project addresses three areas; one being crop production practices, second, weed biology and herbicide resistance, and third, efficient herbicide usage. In crop production practices, systems experiments have been established at three locations that include crop rotation, tillage, seeding method and time, sustainable practices, and effect of weed control intensity on long-term weed infestations and economic returns. In weed biology and herbicide resistance, kochia and Russian thistle seed are being studied. In efficient herbicide usage, a number of factors are being studied such as methods of application to maximize target reception and weed-detecting sprayers to treat only areas where weeds are present.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses new methods to control weeds using systems control with multi-year, multi-crop rotations, reduced pesticide applications, and techniques to enhance herbicide efficiency.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to develop new, efficient weed control methods. To accomplish this, long-term field experiments have been initiated to obtain basic crop-weed biology and production system information. In 1993, the first complete year of the rotation experiments were conducted. The unusual environmental conditions in 1993 substantiate the need for more than one crop rotation cycle to obtain reliable scientific information.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993 was \$500,000 per year; and \$470,000 in 1994. A total of \$1,470,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: no matching in 1991; \$27,030 state appropriations in 1992 and \$48,472 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at North Dakota State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigator anticipates that the work will be completed in the year 2001.

NEW USES FOR AGRICULTURAL PRODUCTS, OHIO

Mr. DURBIN. Please provide a description of the work that has been done under the new uses for agricultural products program.

Dr. JORDAN. This project is funding research to characterize existing markets, identify potential utilization opportunities, develop and evaluate high-potential opportunities, and create and assess strategies to enhance farm income by exploiting new markets. The university has submitted a grant proposal to CSRS for fiscal year 1994, and it is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a regional need to identify possible new uses for basic commodities and specialty items produced in this region to ensure the region's competitiveness in domestic and international markets. Changes in farm programs and trade policies will increase competitiveness in traditional markets, tend to lower incomes, create further excess production capacity, and require new strategies to maintain viability in the agricultural sector.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to find alternative uses, including non-traditional, for commodities produced in the region, resulting in maintenance or increase in farm income.

The first two of the four objectives are complete. These objectives were characterizing existing major markets for agricultural products and identifying potential opportunities to increase utilization. This resulted in a set of research papers and a conference. Progress on the projects for the remaining two objectives is well advanced. The objectives are developing and evaluating high-potential opportunities to expand utilization and assessing strategies or innovations for farmers to enhance income by exploiting new market opportunities. Studies are being continued on non-traditional uses for soy products, health information on the consumption of fats and oils, and demand for corn by-products. No new thrust areas or projects are being proposed.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1988 and 1989, \$133,000 per year; fiscal year 1990, \$131,000; fiscal years 1991-1993, \$140,000 per year; and fiscal year 1994, \$132,000. A total of \$949,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$211,163 State appropriations, \$2,635 product sales, and \$4,440 industry for a total of \$218,238 in 1991; \$74,034 State appropriations, \$30 product sales, \$24,851 industry for a total of \$98,915 in 1992; and \$176,951 State appropriations and \$3,205 industry for a total of \$180,156 in 1993. No determination has been made on the amounts and sources of non-federal cost sharing for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research is being carried out at Ohio State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The original program of research is essentially completed.

NONFOOD AGRICULTURAL PRODUCTS PROGRAM, NEBRASKA

Mr. DURBIN. Please provide a description of the research that has been funded under the Nonfood Agricultural Products Program grant.

Dr. JORDAN. This work focuses on the identification of specific market niches that can be filled by products produced from agricultural materials, developing the needed technology to produce the product, and working with the private sector to transfer the technology into commercial practice. Major areas of application include starch-based polymers, products from milkweed, use of tallow and other animal by-products, and improvements in ethanol production.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Our ability to produce agricultural commodities exceeds our needs for food and feed. These commodities are environmentally friendly feedstocks which can be used in the production of many biochemicals and biomaterials that have traditionally been produced from petroleum. The production of the commodities and the value-added processing of these commodities is regional in scope.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The objectives of the Center are to identify niche markets for industrial utilization of agricultural products, improve and develop conversion processes as needed for specific product isolation and utilization, provide technical, marketing and business assistance to industries, and coordinate agricultural industrial materials research at the University of Nebraska-Lincoln. This project has had specific annual goals pertaining to development of starch-based plastic foams, protein films, corn-whey fermentations, acetone-butanol ethanol fermentations/separations, and beef tallow and soybean oil biodiesel fuels. Although most of these projects have not been completed, several significant accomplishments can be identified: a patent is pending on a starch-based plastic foam, a patent application is being prepared on a continuous corn-whey fermentation process, a continuous starch liquefaction process has been developed for use in fermentation processes, significant grant

support has been obtained as a result of start up funding through this project, and significant progress has been made on protein films, emissions, testing of biodiesel fuels, use of soybean oil as a drip oil for irrigation pumps, and membranes for improved fermentation separations.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The funding levels for this project are \$109,00 in 1990; \$110,000 per year in fiscal years 1991-1993, and \$103,000 fiscal year 1994. A total of \$542,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-Federal funding for this project are in fiscal year 1992, \$315,000, fiscal year 1993, \$330,000, and fiscal year 1994, \$330,000.

These funds were from Nebraska Corn, Soybean, Wheat Sorghum and Beef Boards, World Wildlife Fund, Nebraska Bankers Association, United Soybean Board and National Corn Growers Association.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Industrial Agricultural Products Center, L.W. Chase Hall, University of Nebraska, East Campus, Lincoln, Nebraska.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Another two years will complete the projects we are currently giving major emphasis.

OIL RESOURCES FROM DESERT PLANTS, NEW MEXICO

Mr. DURBIN. Please provide a description of the work that has been done under the Oil Resources from Desert Plants grant.

Dr. JORDAN. The Plant Genetic Engineering Laboratory has been exploring the potential for the production of high value industrial oils from agricultural products. The effort has been focused on transferring the unique oil producing capability of jojoba into oil-seed rape and soybean. With the development in the PGEL lab of technology to both isolate the enzyme components of oil biosynthesis and successfully transform the target plants, significant advances have been made with jojoba. This year PGEL has begun to look at other plant sources of other unique industrial oils, such as: vernonia, lesquerella, castor, and meadowfoam. The fiscal year 1993 grant supports research through September, 1994. The 1994 grant proposal has been received and is being processed for research through September, 1995.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Desert plant sources of valuable oils for industrial applications are typically low yielding and limited in climatic areas for farm production. Genetic engineering offers an opportunity to move genetic capability to high yielding, major crops. Many of the oils and their derivative acids, waxes etc. can directly substitute for imports of similar polymer materials, especially petroleum.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Progress in the last year includes: preparation of the reductase gene for insertion in rapeseed, isolation of the transacylase enzyme in jojoba liquid wax, continued characterization of the reductase enzyme, screening to identify a broader range of enzymes involved with lipid biosynthesis, and continued work to develop a reliable method of transformation of soybeans for insertion of jojoba genes. These are milestones toward accomplishing the assigned goal of successful transfer of genetic capability.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. This work began in fiscal year 1989 with a \$100,000 grant under the Supplemental and Alternative Crops program. Grants have been awarded under the Special Research Grants program as follows: fiscal year 1990, \$148,000; fiscal years 1991-1993, \$200,000 per year; and fiscal year 1994, \$188,000. A total of \$1,036,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds are not provided for this research. New Mexico State University and the Plant Genetic Engineering Laboratory provide unspecified in-kind support including faculty salaries, graduate student stipends, facilities, equipment maintenance and administrative support services.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted by the Plant Genetics Engineering Laboratory at New Mexico State University, Las Cruces, New Mexico.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The PGEL proposal for 1994 funds estimates that an additional 1-2 years would be required to complete the project.

OREGON/MASSACHUSETTS BIOTECHNOLOGY PARTNERSHIP

Mr. DURBIN. Please provide a description of the work that has been funded under the Oregon/Massachusetts Biotechnology Partnership grant.

Dr. JORDAN. The intention of the Oregon/Massachusetts Biotechnology Partnership is to facilitate the commercial development of biotechnology products. The Partnership began with funding in fiscal year 1990 and has continued its research but with an interruption in funding in fiscal year 1993. CSRS has requested a grant proposal from Oregon State University for the fiscal year 1994 appropriation, but a proposal has not yet been received. Oregon State University is expected to propose research and technology transfer technology activities in plant biotechnology derived from a two state consortium of universities and public institutions.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. It is estimated that by the year 2000 the world wide market for processed agricultural and food products derived from biotechnology will exceed \$100 billion annually. The Oregon/Massa-

chusetts partnership is a model to study how research may be productively developed and commercialized through partnerships. Research currently underway involves both basic understanding of genetic engineering and the application of biotechnology procedures to develop new products.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the Oregon/Massachusetts Biotechnology Partnership remains to accelerate the development of biological, agricultural and forestry research discoveries and move that knowledge into the marketplace through the creation of new commercial ventures. To accomplish this, Oregon is providing the research infrastructure while the Massachusetts partner is developing the commercial pathway for the products that emerge from the Oregon-based research.

Research projects currently funded through the partnership include: a study of how fungi degrade chemical pollutants; a study of tissue differentiation in plants under genetic control; and the expression of genes in different types of cells. The partnership is also funding pear cultivar improvement using biotechnology and is looking for ways to protect potatoes from virus infection. It is also investigating the use of DNA fingerprinting for the identification of grape rootstocks.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1990, \$247,000; fiscal year 1991, \$500,000; fiscal year 1992, \$537,000; and fiscal year 1994, \$481,000. A total of \$1,765,000 has been appropriated. The appropriation for fiscal year 1993 was \$256,000 and was only for Massachusetts.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$269,918 state appropriations, \$37,584 product sales, \$27,334 from industry and \$6,833 miscellaneous in 1991; \$289,501 state appropriations, \$40,310 product sales, \$29,317 from industry and \$7,329 miscellaneous in 1992; there was no Oregon/Massachusetts Biotechnology Partnership appropriation in 1993; and \$297,925 state appropriations, \$41,483 anticipated product sales, \$30,120 from industry and a projected \$7,542 miscellaneous in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is expected to continue at Oregon State University, the University of Oregon, The Oregon Graduate Institute, and the Massachusetts Biotechnology Research Institute.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1998.

PEACH TREE SHORT LIFE

Mr. DURBIN. Please provide a description of the research that has been funded under the Peach Tree Short Life, South Carolina grant.

Dr. JORDAN. Progress continued in 1993 with focus on improvement of peach rootstocks for use in soils where the ring nematode, *Criconebella xenoplax*, is present and contributing to peach tree short life. Field trials of selected rootstocks are continuing. Work has continued on crops such as wheat in the rotation to suppress the pathogen. Additional studies of the physiological effects on peach trees resulting from ring nematode parasitism continued in 1993.

Mr. DURBIN. According to the research proposal, or the principal research, what is the national, regional or local need for this research?

Dr. JORDAN. This problem affects more than 20 percent of the peach acreage in the Southeastern U.S., and amounts to a local and regional need.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to control peach tree short life in South Carolina and in the Southeast, and it remains as such today. The numbered rootstock peach selection 520-9 continued to perform well in field plantings in 1993. Trees on 520-9 grow well, and exhibit good cropping and acceptable horticultural characteristics. The fluorescent pseudomonad strain, which holds nematode populations to a fraction of those present in nontreated soils, has become the standard for comparing suppressiveness of bacterial isolates. Thousands of mutants of the strain have been prepared and are being tested for suppression of nematode egg hatch. Evaluation of nimblewill as a ground cover will continue in fiscal year 1994.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1981, \$100,000; fiscal years 1982-1985, \$192,000 per year; fiscal years 1986-1988, \$183,000 per year; fiscal year 1989, \$192,000; fiscal year 1990, \$190,000; fiscal years 1991-1993, \$192,000 per year; fiscal year 1994, \$180,000. A total of \$2,555,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$149,281 state appropriations in 1991; \$153,276 state appropriations in 1992; \$149,918 state appropriations in 1993; and \$138,000 state appropriations estimated in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the South Carolina Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that some phases of the work will be completed in fiscal year 1996.

PERISHABLE COMMODITIES

Mr. DURBIN. Please provide a description of the research that has been funded under the Perishable Commodities, Georgia grant.

Dr. JORDAN. The overall objective of this research is to investigate federal and private sector grade standards governing the cosmetic appearance of perishable commodities and determine how they affect pesticide use. The research is designed to determine pesticide application amounts on perishable commodities, the extent to which federal grade standards affect pesticide use, the effect of reducing emphasis on cosmetic appearance in grade standards upon use of pesticides, and adoption of agricultural practices that will result in reduced pesticide use and the extent to which grade standards reflect consumer preferences.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses the need for a comprehensible evaluation of the grading standards for perishable commodities and to determine pesticidal use impacts.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The Perishable Commodities—Georgia reflects the subject area and location from which the study is being conducted. A thorough review of the federal grade standards is complete for the nine targeted commodities which include apples, bell peppers, oranges, sweet corn, tomatoes, peaches, cabbage, cucumbers, and squash. Several inconsistencies in the federal grade standards have been identified.

The researchers also note that most agricultural product grading systems have been developed over decades and have been confined to the ability to rapidly measure a trait. These grading systems are used to establish the price that farmers, wholesalers, brokers, produce buyers and food companies trade on. However, most marketing standards have no direct measure of the traits consumers want when purchasing a product. These traits include flavor, nutrition, self-life and production practices. Instead, most raw agricultural produce standards are based on categories related to size, shape, color and surface blemishes.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993. The appropriation for fiscal year 1993 was \$250,000 and for fiscal year 1994 is \$235,000. A total of \$485,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds have not been provided for this grant.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the National Environmentally Sound Production Agriculture Laboratory, which is located on the University of Georgia Coastal Plain Experiment Station campus.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1996.

PEST CONTROL ALTERNATIVES, SOUTH CAROLINA

Mr. DURBIN. Please provide a description of the research that has been funded under the Pest Control Alternatives grant.

Dr. JORDAN. The goal of this research is to investigate and develop alternative methods of pest control in vegetable crops as complements to or as substitutes for conventional chemical sprays. These scientists plan to develop microbial pest control agents, determine the effectiveness of innovative cultural practices, assess the role of indigenous biological control agents in controlling pests of vegetables, evaluate vegetable crop germplasm for pest resistance, and work with growers to implement alternative pest control practices. The fiscal year 1993 grant supports research through April 1995. The 1994 grant proposal has been received and reviewed and is ready to be awarded.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The vegetable industry in the Southeast includes the production of over 38 crops, mostly for fresh market use, with a value of over \$2 billion. The vegetable industry is growing and thriving. There is increasing concern about pesticides in vegetables and interest among consumers in having the option to purchase pesticide-free food products. Over 200 million pounds of pesticides, costing over \$400 million annually, are being used in the Southeast, to control pests of vegetables. Because of the many pests of vegetables in the Southeast, the livelihood of the vegetable industry into the Southeast is at risk because of pest control-related problems. Problems of vegetable food production in the Southeast are common to Texas, California, and other states.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. This project is developing new, non-chemical technology for the management of pests of vegetables and working with growers to implement the results. Microbial pest control agents are being screened for use against wirestem of the Brassica vegetable crops. A granulosis virus is being developed for the imported cabbage worm and it looks good for home gardens and organic gardening conditions. Methods to protect the virus from breakdown by sunlight are being tested and may make the virus more viable in commercial crops. New pathogens of vegetable pests have been found in Indonesia. Solarization, colored mulches, and crop rotations are being tested for their utility in cultural control of pests of vegetables. Extension field days and other educational methods are being used to inform growers of results. On-farm demonstrations are being conducted to showcase the successful methods.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993; was \$125,000 per year and \$118,000 in 1994. A total of \$368,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. South Carolina has provided \$124,860 support for the Special Grants project on Pest Control Alternatives from State appropriations during 1993 and will provide the same amount in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the South Carolina Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers at Clemson University anticipate that work may be completed by March 1996.

PESTICIDE CLEARANCE

Mr. DURBIN. Please provide a description of the research that has been funded under the Pesticide Clearance grant.

Dr. JORDAN. The pesticide clearance program—IR-4—includes the State Agricultural Experiment Stations and United States Department of Agriculture-Agricultural Research Service—ARS. IR-4 provides the national leadership, coordination and focal point for obtaining tolerance and safety data for pesticides and biological control agents for specialty crops such as horticultural crops. The agricultural chemical industries have not economically justified the time and expense to conduct the necessary research for pesticides with small market potential. With the Federal registration resulting from this research, a large number of small acreage crops such as vegetables, fruits, nuts, spices and other specialized crops have been provided with needed crop protection against pests. Protocols are written after careful review and representatives of grower groups, the chemical industry and researchers. The researchers then carry out field trials on priority needs to determine their effectiveness, safety and usefulness and then analyze the field grown commodities, where appropriate, to identify and quantify any residues that may persist. All of this is done according to Good Laboratory Practices guidelines. The research program then assimilates the data from all the participating experiment stations, grower groups and chemical industry, and petitions are written for tolerances and Federal registration or reregistration. The 1993 grants terminate between February 1994 and February 1996. Grants for 1994 have been received and are being processed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The goal is to conduct research to register or reregister pesticides or biological control agents for pest problems on minor crops. This is a national research effort which identifies

needs by a network of users and state university and federal researchers.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. One goal is to obtain minor use and specialty use pesticide clearances and assist in the maintenance of current registrations. And another is to further the development and registrations of microbial and specific biochemical materials for use in pest management systems. Since its beginning, the IR-4 Project has been responsible for data to support 4,566 clearances, representing 1,451 tolerances and exemptions on food crops. In addition, 15 biological pest control agents have received clearance. For ornamental crops, a total of 3,150 labels for use of pesticides have been issued.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from appropriated funds as follows: Program redirection in fiscal year 1975, \$250,000; fiscal year 1979, \$500,000; fiscal years 1977-1980, \$1,000,000 per year, fiscal year 1981, \$1,250,000; fiscal years 1982-1985, \$1,400,000 per year; fiscal years 1986-1989, \$1,369,000 per year; fiscal year 1990, \$1,975,000; fiscal year 1991, \$3,000,000; fiscal years 1992 and 1993, \$3,500,000 per year; and fiscal year 1994, \$6,345,000. A total of \$35,556,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$891,856 state appropriations and \$65,402 industry in 1991; \$1,002,834 state appropriations and \$104,292 industry in 1992; \$1,086,876 state appropriations, and \$310,133 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Field work is performed at the State and Territorial Experiment Stations. Laboratory analysis is conducted primarily at the California, New York, Florida and Michigan Agricultural Experiment Stations with assistance by the Oregon, Hawaii, North Dakota, Arkansas, North Carolina, Washington, Virginia, Mississippi, Idaho, Pennsylvania and New Jersey Agricultural Experiment Stations. Protocol development, data assimilation, writing petitions, and registration processing are coordinated through the New Jersey Agricultural Experiment Station. ARS is conducting minor use pesticide studies at locations in California, Georgia, Illinois, Maryland, Ohio, Oregon, South Carolina, Texas, and Washington. ARS laboratories in Georgia, Maryland and Washington are cooperating with analyses.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Selected categories of the Special Research Grants program address important national and regional research initiatives. The pesticide clearance program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. The IR-4 workload is anticipated to be long term because of the new sensitivities about food safety and the environmental, plus the 1988 amendments to FIFRA regarding

reregistration. IR-4 administration has developed a strategy in response to the FIFRA 88 amendments to register 2,600 new minor uses and reregister 1,000 needed minor uses. Additionally, the biocontrol pest program which promotes new and safer pest control technology for minor crops will be expanded.

PESTICIDE IMPACT ASSESSMENT

Mr. DURBIN. Please provide a description of the research that has been funded under the Pesticide Impact Assessment grant.

Dr. JORDAN. Research funded is targeted to fill pesticide informational needs and for pesticide assessment reports compiled by USDA and used by EPA. Research has focused on pesticide benefits and use surveys, environmental fate of pesticides, pesticide residues, and exposure and risk assessments.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This project is a national effort involving all state Agricultural Experiment Stations and State Cooperative Extension Services and coordinated by USDA. The program serves to provide USDA with risk/benefit assessment reports and contributes to the EPA pesticide regulatory decision making process.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original and current goal is to provide comprehensive assessments on pesticides by collecting and coordinating research and information from our state cooperators for the EPA decision-making process on pesticide regulations. Data and objective interpretations of pesticide benefits and risks are required to meet these responsibilities. Research efforts to date have contributed important information on environmental effects, human exposure risks, economic impacts and crop quality and yield data. Information has been generated which is useful in minimizing potential human risks; this includes application technology, pesticide detection methodology, and determination of factors governing environmental fate. An economic impact model has been developed and tested and will be made available for expanded use.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: Fiscal years 1977-1981, \$1,810,000 per year; fiscal years 1982-1985, \$2,069,000 per year; fiscal years 1986-1988, \$1,968,000 per year; fiscal year 1989, \$2,218,000; fiscal year 1990, \$2,437,000; fiscal years 1991, 1992 and 1993, \$2,968,000 per year; and fiscal year 1994, \$1,474,000. A total of \$38,263,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. A major source of non-federal funds comes through the State Agricultural Experiment Stations. Time spent on Pesticide Impact Assessment activities by each state Liaison Representative and other faculty is paid by each State, and the total is estimated at \$2,562,000 per year.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This work is underway at State Agricultural Experiment Stations in 53 states and Territories. Competitively awarded research funds which fill both national and regional informational needs are coordinated through a lead State in each of the four regions of the United States which are the West, California; North Central, Ohio; Northeast, Pennsylvania; and the South, Georgia.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Activities related to reregistration under FIFRA '88 are projected to be complete by the end of calendar year 1997. However, the pesticide impact assessment program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. There is a high priority for continuation of these ongoing projects into the twenty-first century, particularly in view of increased public concerns about food safety and the environment.

PESTICIDE RESEARCH, WASHINGTON

Mr. DURBIN. Please provide a description of the research that has been funded under the Pesticide Research—Washington grant.

Dr. JORDAN. This special grant for Washington State University is also shared by Washington with Idaho and Oregon to establish a cooperative pesticide analytical and information program for food quality/pesticide research with Washington State University as the lead organization. The purpose of the research is to ensure the continued availability of pesticides required by producers of crops and animal products in the tri-state region. This includes determining the range of pesticide residue studies needed by producers and processors, with emphasis on regional specialty crops; identifying crops and animal products with anticipated critical residue investigations needed in the next decade; projecting the types of studies needed to control environmental contamination by pesticides; identify development needs, such as general laboratory availability, and operational costs; and identifying appropriate support staff requirements. Washington has established a Food and Environment Quality Laboratory to investigate the fate of pesticides on crops and in the environment and to support minor crop registrations through the IR-4 program. The 1994 grant proposal has been requested.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The goal of the Northwest Tri-State Pesticide Research Program is to strengthen pesticide analytical and informational capabilities of the three northwest states—Washington, Oregon, and Idaho. This goal is being pursued by collaborative planning and execution among the pesticide analytical laboratories of the three land-grant universities and cooperation with pesticide analytical laboratories of the three State Departments of Agriculture and other regional pesticide laboratories.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was a feasibility study of the needs of the region that might be served by a regional analytical pesticide

research laboratory. During the first three years, the project has focused on laboratory development. Facilities at Washington State University—Tri-Cities campus were remodeled to create the Food and Environmental Quality Laboratory. Existing pesticide analytical programs at Oregon State University and the University of Idaho was initiated. A cooperative pesticide analytical and information program in the Tri-State region was with Washington taking lead.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from appropriated funds as follows: fiscal year 1990, \$49,000, fiscal year 1991, \$484,000; fiscal years 1992 and 1993, \$667,000 per year, fiscal year 1994, \$627,000. A total of \$2,494,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: no matching in 1991; no matching in 1992; \$524,400 state appropriations, \$458 product sales, and \$28,517 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Washington State University in cooperation with the University of Idaho and Oregon State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work through fiscal year 1996 should result in significant achievements towards the objectives of this project.

PHYTOPHTHORA ROOT ROT, NEW MEXICO

Mr. DURBIN. Please provide a description of the research that has been funded under the Phytophthora Root Rot, New Mexico grant.

Dr. JORDAN. Efforts have continued on the development of chile cultivars with resistance or tolerance to the *Phytophthora* fungus. Other work has involved development of cultural practices that will foster maintenance of the new cultivars once introduced to field production conditions.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The phytophthora disease continues to spread in the west Texas, New Mexico, and Eastern Arizona chile pepper production region. Therefore, this research has regional as well as local significance.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was the development of resistant chile cultivars compatible with new cultural practices for the management of the root rot. Significant progress has been made in the identification of potential chile germplasm candidates that show field tolerance to the pathogen. Since control of the disease has

been found to be very complex, New Mexico Experiment Station scientists took the initiative in addressing this complexity by beginning studies on the impact of cultural practices on disease development.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 with an appropriation of \$125,000 for fiscal year 1991. The fiscal years 1992-1993 appropriation was \$150,000 per year and it is \$141,000 in 1994. A total of 566,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$363,965 state appropriations in 1991; \$363,965 state appropriations in 1992; \$363,965 state appropriations in 1993; and \$363,965 state appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at New Mexico State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1995.

POTATO RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the Potato Research grant.

Dr. JORDAN. Scientists at several of the State Agricultural Experiment Stations in the Northeast, Northwest, and North Central States, are breeding russet type, high yielding, disease and insect resistant potato cultivars, adapted to the growing conditions in their particular areas, both for the fresh market and processing. Research is being conducted in such areas as protoplast regeneration, somoclonal variation, storage, propagation, germplasm preservation, and cultural practices.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This research effort addresses needs of the potato producers and processor. Research areas being studied include storage and post-harvest handling of potatoes and their effect on potato quality. Regional needs are breeding and genetics, culture factors and pest control on potato production.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to improve potato production through genetics and cultural practices as well as improve storage for quality potatoes for processing and fresh market. This research has resulted in a number of new high yielding, good quality, disease and insect resistant, russet type cultivars, which are now being used in the processing industry and in the fresh market. Re-

search at Washington State University has resulted in the release of three cultivars: Ranger Russet, Frontier Russet and Chipeta.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1983, \$200,000; fiscal year 1984, \$400,000; fiscal year 1985, \$600,000; fiscal years 1986-1987, \$761,000 per year; fiscal year 1988, \$997,000; fiscal year 1989, \$1,177,000; fiscal year 1990, \$1,310,000; fiscal year 1991, \$1,371,000; fiscal years 1992 and 1993, \$1,435,000 per year; and fiscal year 1994, \$1,349,000. A total of \$11,796,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$401,424 state appropriations, \$4,897 product sales, \$249,830 industry, and \$30,092 miscellaneous in 1991; \$567,626 state appropriations, \$6,182 product sales, \$334,478 industry, and \$44,323 miscellaneous in 1992; and \$556,291 state appropriations, \$9,341 product sales, \$409,541 industry and \$44,859 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research work is being carried out at the Cornell, Idaho, Maine, Maryland, Michigan, North Dakota, Oregon, Pennsylvania, and Washington State Agricultural Experiment Stations.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that their work may be completed in fiscal year 1995.

PRESERVATION AND PROCESSING RESEARCH, OKLAHOMA

Mr. DURBIN. Please provide a description of the research that has been funded under the preservation and processing grant.

Dr. JORDAN. Fruit and vegetable cultivars have been evaluated for harvest quality and storage and shipping potential, critical biological processes limiting shelf life and potential for mechanical harvest of fresh horticultural commodities have been investigated, optimum storage and shipping conditions for commodities have been identified, and a device was developed to nondestructively measure maturity for selected fruits and vegetables. In addition, new processing technologies are being developed for commercial adaptation to improve the oxidative stability and reduce the calorie content of tree nuts.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research and development activities for preservation and processing research in Oklahoma support development of instrumentation for and procedures to efficiently handle and process horticultural commodities, with special emphasis on those commodities best suited for profitable production in that region. Improvements in postharvest handling and processing are necessary to support growth of the industry and to ensure competitive-

ness in national and international commerce for horticultural commodities uniquely suited for production in Oklahoma.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the research was to define the major limitations for maintaining quality of harvested fruits and vegetables, prescribe appropriate harvesting, handling and processing protocols to extend shelf life of harvested horticultural commodities, thus maintaining profitability of production systems and assuring an economic market niche for Oklahoma producers. A systems approach to develop complementary cropping, harvesting, handling, and processing operations has resulted in development of improved handling systems for cucurbit and tree fruit crops. Research and development activities to support commercial adaptation of instrumentation for nondestructive on-line determination of fresh fruit and vegetable maturity have been supported and industry prototypes should be available by 1997. An Oklahoma-based manufacturer is cooperating on this project, and matching funding to support technology transfer for commercialization of the instrument has been obtained from a state agency. Technologies and procedures previously developed for cucurbit and tree fruit systems are now being applied to support development of profitable okra, tree nut and sweet corn cropping, handling and light processing systems, with a targeted completion date of 1999.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, \$100,000; fiscal year 1986, \$142,000; fiscal year 1987, \$242,000; fiscal years 1988 and 1989, \$267,000 per year; fiscal year 1990, \$264,000; fiscal year 1991, \$265,000; fiscal year 1992, \$282,000; fiscal year 1993, \$267,000; and fiscal year 1994, \$251,000. A total of \$2,363,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Support from the State of Oklahoma, through the Oklahoma Agricultural Experiment Station and through the Oklahoma Centers for Advancement of Science and Technology, have been provided as follows: \$126,900 for fiscal year 1991, \$209,783 for fiscal year 1992, and \$219,243 for fiscal year 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Oklahoma State Agricultural Experiment Station, in conjunction with ongoing production research at the Wes Watkins Agricultural Research and Extension Center.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The project investigators anticipate that the fiscal year 1994 grant will support work through June 1996.

PROCERUM ROOT DISEASE

Mr. DURBIN. Please provide a description of the research that has been funded under the Procerum Root Disease, Virginia grant.

Dr. JORDAN. Research has continued to involve study of the epidemiology of the disease. University scientists have studied vector

behavior to determine when they are likely to transmit the fungal pathogen. Various chemical insecticides were tested to determine if they are effective in controlling this disease.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This disease has spread throughout Southwest Virginia, causing losses of over 800,000 eastern white pine trees. The pathogen is found in plantations and natural stands of pines throughout Virginia and the southeastern United States. Therefore, this disease is of local and regional significance.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to gain information that will foster the establishment of a comprehensive management program for procure root disease in Christmas tree plantations. Studies on the pales weevil indicate that the pathogen may be carried internally; however, more research is need to determine unequivocally if this means of spread is a factor. Other weevil species were found to carry the fungus. Testing efficacy of currently recommended insecticides for control of the weevil vectors has resulted in variable performance. The search for better chemical control will be continued.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992, and the appropriation for fiscal years 1992-1993 was \$25,000 per year and \$24,000 in 1994. A total of \$74,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$1,721 state appropriations, \$260 industry, and \$104 miscellaneous in 1992; \$4,794 state appropriations, \$162 industry and \$149 miscellaneous in 1993. The Virginia Station anticipates that fiscal year 1994 expenditures will be approximately the same as fiscal year 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Virginia Polytechnic Institute and State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1995.

PRODUCT DEVELOPMENT AND MARKETING CENTER, MAINE

Mr. DURBIN. Please provide a description of the work that has been done under the product development and marketing center program.

Dr. JORDAN. The purpose of this grant is to conduct a program of research to develop new and innovative marketable food and forest products, increase both domestic and international market opportunities for Northern New England food and forest products, and enhance the marketing skills of producers and consumers to

take advantage of new market opportunities. Collaboration with other land-grant universities has been initiated on research. The university has submitted its grant proposal to CSRS for fiscal year 1994, and it is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The northern new England regional economy has been adversely impacted by the recession. This has motivated the region to initiate research to seek new economic opportunities for its natural resource-based industries in order to stimulate its rural economies.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to conduct a program of research to develop foreign and domestic markets, and products for these markets made from agricultural, forest, and fish items produced in the region. Another goal is to transfer this knowledge to producers and sellers.

Investigators have initiated programs to develop or improve seafood, potato, apple, and blueberry product and food processing methods. They also are designing programs to assess domestic and international markets for these products. On-site market assessments have been made in Europe for forest products. An inventory of forest resources is nearly completed, and utilization of underused forest species is being investigated. An extensive effort has been made to develop technology and information transfer programs to inform producers and marketers of these opportunities and buyers of the availability of products and sources.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992 and 1993 was \$221,000 per year and \$400,000 for fiscal year 1994. A total of \$842,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$37,830 State appropriations in 1992, and \$25,063 State appropriations in 1993. No determination has been made on non-federal funding for 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is carried out by the University of Maine.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This phase of the strategic plan may be completed in 1997.

RED RIVER CORRIDOR, MINNESOTA AND NORTH DAKOTA

Mr. DURBIN. Please provide a description of the work that has been done under the Red River corridor program.

Dr. JORDAN. The purpose is to conduct a program of research to assess emerging international trade opportunities for the Red River trade region. Projects were initiated to assess the Corridor's transportation infrastructure, research and development capability, competitive position, export opportunities in Europe and Latin America, and trade strategies. Emphasis is placed on technology and information transfer to inform users and potential users. The University of Minnesota has submitted a grant proposal for fiscal year 1994 to CSRS that is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a regional need to find new and alternative markets to replace traditional markets that have little or no growth potential. International trade is expected to support continued economic growth in this primarily rural region.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to identify and assess export market opportunities and determine the means to improve the region's competitiveness in international trade.

The program has completed studies on transportation services and costs, the region's trade position on specialty crops and metal fabrication, agro-industrial research and development capabilities, and export opportunities through collaboration with Canada. Studies are in progress on trade strategies of selected European regions, trade opportunities with Mexico, and bilateral technology transfer among businesses in the region. Three new projects will be undertaken with this grant on Latin American transportation, opportunities and linkages between rural Mexico and the Red River region, and social structure and rural development.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. The appropriation for fiscal years 1992-1993 was \$200,000 per year and it is \$188,000 in 1994. A total of \$588,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant are as follows: \$4,300 State appropriations, and \$2,269 miscellaneous for a total of \$6,569 in 1992; \$16,000 State appropriations, \$4,138 industry, and \$16,688 miscellaneous for a total of \$36,826 in 1993; and \$1,600 State appropriations, \$1,637 industry, and \$4,501 miscellaneous to date for a total \$7,738 in 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program is carried out at the University of Minnesota, Crookston, in collaboration with North Dakota State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers indicated that this phase of the program may be completed in fiscal year 1997.

REGIONAL BARLEY GENE MAPPING PROJECT

Mr. DURBIN. Please provide a description of the work that has been funded under the Regional Barley Gene Mapping Project grant.

Dr. JORDAN. The objectives of this project are to: construct a publicly available medium resolution barley genome map; use the map to identify and locate loci, especially quantitative trait loci controlling economically important traits such as yield, maturity, adaptation, resistance to biotic and abiotic stresses, malting quality, and feed value; provide the framework for efficient molecular marker-assisted selection strategies in barley varietal development; identify chromosome regions for further, higher resolution mapping with the objective of characterizing and utilizing genes of interest; and establish a cooperative mapping project ranging from molecular genetics to breeding that will be an organizational model for cereals and other crop plants. The fiscal year 1993 grant supports research through June 1994. The fiscal year 1994 grant proposal has been received and is in the final stages of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Barley breeders nationwide need information about the location of agriculturally important genes controlling resistance, to biotic and abiotic stresses, yield, and quality factors in order to rapidly develop new, improved cultivars and respond to disease and pest threats. This project provides that information along with appropriate molecular markers to track these traits through the breeding and selection process.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this project remains to develop a restriction fragment length polymorphism map for barley and associated important genetic traits as a map to provide closely linked molecular markers for barley breeders. The project has successfully mapped 300 molecular markers. Portions of the map are described as very dense and contain key location points for enhanced utility. The project has also identified quantitative traits loci of economic importance. These include genetic determinations for yield, maturity, rust resistance, plant height, seed dormancy, and components of malting quality. Technical papers have been published to report results to the scientific community.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1990, \$153,000; fiscal year 1991, \$262,000; fiscal years 1992-1993, \$412,000 per year; and fiscal year 1994, \$387,000. A total of \$1,626,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$203,760 from industry in 1991; \$212,750 from industry in 1992; \$115,000 from industry in 1993; and \$89,000 from industry in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted in the following states: Oregon, Colorado, Washington, Michigan, Montana, Idaho, North Dakota, Minnesota, Alaska, New York, and Virginia.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that researchers will complete the four year program plan at the end of fiscal year 1994.

REGIONALIZED IMPLICATIONS OF FARM PROGRAMS

Mr. DURBIN. Please provide a description of the work that has been done under the program on regionalized implications of farm programs grant.

Dr. JORDAN. The purpose of this research is to estimate farm, trade, and fiscal policy and program impacts and assess their alternatives on the economic viability of typical crop and livestock producers located in different regions of the United States. The universities have submitted their fiscal year 1994 proposals to CSRS, and they are being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. There is a national need for research that provides an interpretation of the potential impacts of Federal farm, trade, and fiscal policies to farmers throughout the United States. The research results also are widely used by public policymakers concerned about the implications of such policies and alternative measures.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was and continues to be to provide the farm community, extension, and public officials information about farm, trade, and fiscal policy implications by developing regionalized models that reflect farming characteristics in several locations in the United States. The researchers have developed a farm level policy analysis system encompassing major U.S. farm production regions. This system interfaces with existing agricultural sector models used for farm, macroeconomic, and trade policy analysis. The universities have expanded the number and types of representative farms to 65. Studies completed this past year include a baseline projection for crop farms, deficit reduction impacts, BTU tax study, House Reconciliation Package impacts, and analysis of the flexibility provisions in the 1990 Food, Agriculture, Conservation, and Trade Act. Plans are to refine the analytical models in preparation for making analyses of proposals for the 1995 farm bill in response to farm groups and public officials.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1990 and the appropriation for fiscal year 1990 was \$346,000.

The fiscal years 1991–1993 appropriations were \$348,000 per year and it is \$327,000 in 1994. A total of \$1,717,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$288,843 State appropriations and \$46,773 industry for a total of \$335,616 in 1991; \$45,661 State appropriations in 1992; \$33,979 State appropriations in 1993; and \$40,967 State appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by the Texas A&M University and University of Missouri.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. This phase of the program should be essentially completed when the 1995 Farm Bill, trade, and fiscal policy legislation are enacted.

RURAL DEVELOPMENT CENTERS

Mr. DURBIN. Please provide a description of the research that has been funded under the Rural Development Centers Program grant.

Dr. JORDAN. The Centers address a broad spectrum of problems facing rural people and places with integrated programs of research and outreach tailored to national, State and regional contexts. The Centers provide a catalytic base to stimulate and focus the research leadership of institutions of higher education on rural problems and inform State and local government, non-profit and volunteer groups, and the business community. The fiscal year 1993 grants terminate between July 1995 and September 1996. Proposals for fiscal year 1994 have been requested for program review.

Mr. DURBIN. According to the research proposal, or one of the principal investigators, what is the national, regional or local need for this research?

Dr. JORDAN. Many organizations speak for rural development research and outreach at one or more levels from national, to regional, to State, or local. The Centers are unique because they are the only rural development organizations positioned to effectively integrate research and programmatic outreach across all these levels. In a recent review of the Centers by a national panel of rural experts, one reviewer commented that if the Centers did not currently exist, we would have to invent them because there is no other organization to do what they do. The Centers' needs for research are articulated in their annual proposals. Input to the proposals comes through an advisory panel and a board of directors. Both of these include individuals from local and State governments or other rural development interests at the grass roots level. Each Center's program is also reviewed periodically by a panel of national level experts. The Centers respond to research needs articulated at all levels. The annual proposals then attempt to address the most important and timely of these needs, within budgetary limits, in a comprehensive and integrated effort.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the Centers was to regionally coordinate research and extension programs authorized under the Rural Development Act of 1972. Over time they have been increasingly look to for both programmatic leadership as well as coordination and have emerged as the dominant regional and national rural development institution within the land-grant university system. The 1993 annual reports from the Centers list the following selected examples of the Centers' accomplishments. A recent Western Center project evaluated the long-term impacts of a two week public policy training session for Extension specialists conducted in 1976. After an interim period of 15 years, all of the respondents said they continue to find new opportunities for public policy education and become more involved in it as a result of the training. The study points to the value and long-term return of good educational programming even though it may be difficult to observe in the short run. A Northeast Center study of the impacts of elderly retirees returning to rural areas found that the recent immigrants do not immediately place high demands on public services as has often been claimed. However, the longer they stay, the more the public service capacity is strained. Immigrant elderly bring wealth into rural areas but they also bring increased demand for commercial goods and services that increases the cost of living to long-term residents. A North Central Center study of declining retail trade in rural areas corroborated other findings that small, locally-owned businesses often lacked the management skills and do not have access to management and other technical training. The locally-owned businesses could not compete effectively with nationally or regionally owned chains. Additionally, they found that many of the family operated businesses had not made plans for transferring the business operation to anyone. Thus, when the operators became too old to continue or decided to retire, the result was a business shut-down with attendant loss of service to the community. Actions to correct these problems were suggested. Analysts at North Dakota State University found that fixed costs of operation place rural hospitals in severe jeopardy because the dwindling population has caused a decline in hospital utilization. This information has been presented to a State health task force to help them develop a new strategic plan to improve health care access in North Dakota.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1971, \$75,000; fiscal year 1972, \$225,000; fiscal year 1973, \$317,000; fiscal year 1974 through fiscal year 1981, \$300,000 per year; fiscal year 1982 through fiscal year 1985, \$311,000 per year; fiscal year 1986 and fiscal year 1987, \$363,000 per year; fiscal year 1988, \$475,000; fiscal year 1989, \$500,000; fiscal year 1990, \$494,000; and fiscal years 1991-1993, \$500,000 per year; fiscal year 1994, \$470,000. A total of \$8,426,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-Federal funds available to the four Regional Centers for Rural Development were: fiscal year 1991, \$1,117,000; fiscal year 1992, \$790,000; fiscal year 1993, \$900,000; for a total of \$2,807,000 across the three years for which there are complete

data. Non-federal funds to the North Dakota State Center were: fiscal year 1991, \$270,060; fiscal year 1992, \$259,335; fiscal year 1993, \$74,567; for a total of \$603,962 across the period.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The regional rural development centers are located as follows: Northeast Regional Center for Rural Development, Pennsylvania State University; North Central Regional Center for Rural Development, Iowa State University; Southern Rural Development Center, Mississippi State University; Western Rural Development Center, Oregon State University. Most of the research sponsored by the four regional centers is actually performed by resident faculty at land-grant universities in the respective region through subcontracts from the Center's grant. In addition, the special project at North Dakota State University is included in the appropriation.

Mr. DURBIN. When do the principal researchers carry out this work anticipate that the work will be completed?

Dr. JORDAN. A specific termination date has not been identified.

RURAL HOUSING NEEDS, NEBRASKA

Mr. DURBIN. Please provide a description of the research that has been funded under the rural housing needs grant.

Dr. JORDAN. Data on housing affordability have been collected in eight representative rural communities. These data are being compared to national data to determine the relationship of rural housing affordability to common indexes used nationally. Based on these analyses, improved affordability indexes are being developed for use in examining the housing status of families in rural areas and to manage rural housing programs.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This research will improve the information base for developing, implementing, and reviewing rural housing policies. The project will result in consistent approaches to measuring housing affordability in rural areas.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this project is to compare and contrast alternate housing affordability indexes using both national and State data. Housing affordability indexes are critical in managing housing programs and monitoring economic activity and opportunity. This project is intended to improve the accuracy of indexes used in rural areas and assist local communities to evaluate barriers to housing assistance. The researchers have conducted a series of focus group discussions with elected officials, government professionals, bankers, real estate sellers, developers, contractors, social workers, and community action agency representatives to identify barriers to housing policy implementation in small communities. These sessions, and ongoing analysis of national data, are being used to develop policy statements and dialogue regarding rural housing for local leadership training.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The research began in March 1993, supported by the fiscal year 1993 appropriation of \$80,000. In fiscal year 1994, \$75,000 was appropriated for a total of \$155,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this project in fiscal year 1993 were \$25,071 in State funding; the same amount and source is included in the proposal for fiscal year 1994.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research is being conducted at the University of Nebraska with the University of Wisconsin as a subcontractor.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work funded in fiscal year 1994 will be completed in fiscal year 1995.

RURAL POLICIES INSTITUTE

Mr. DURBIN. Please provide a description of the research that has been funded under the Rural Policies Institute grant.

Dr. JORDAN. The Rural Policy Research Institute is a consortium of three universities which share the grant. Separate awards are made to the member universities based on distributional decisions recommended by Institute staff to the Institute's Board of Directors. The consortium develops methods and databases to estimate impacts of current and alternative policies on the economic vitality of rural people and places. Much of the past work has been directed to strategic planning, development of appropriate databases, and the creation of organizational linkages among the faculty and administrators of the three universities involved. Fiscal year 1993 grant awards terminate between September 1994 and July 1996. The proposal for research to be conducted under the fiscal year 1994 appropriations has been received and is under Agency review prior to an award decision.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. There is a need to be able to estimate the impacts of new programs and policies on rural people and places. For example, policy instruments such as the North American Free Trade Agreement have differential impacts on rural people across the various regions. Similarly, rural health care may be affected by proposed changes in national programs of health care funding. It is important to the welfare of rural people and places that we develop an understanding of these impacts and that the understanding be communicated accurately and fairly to the policy process.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the Rural Policy Research Institute was to be an experiment in fulfilling the need to have a research unit that could provide timely, accurate, and unbiased estimates of the impacts of policies and new policy initiatives on rural people and places. The Institute has completed a number of successful topical policy research projects and made considerable progress in developing a system of policy impact models that are

central to its mission. The topical research projects, which focus on the rural implications of health care, education, and telecommunications policy proposals, have generated over 50 papers published as research journal articles, working papers, or policy briefs. In addition, the Institute's research Plan of Work outlines five different econometric and policy indicator models to help policymakers assess the impacts of various policy alternatives on rural people and places. Three of the five models—the regional impact, the community economic and fiscal impact, and the Institute's rural baseline—are now being applied in ongoing policy analysis.

The Rural Policy Research Institute has used its research base to respond to numerous requests for information from policy decision makers, including a recent Expert Panel Briefing sponsored by the Congressional Rural Caucus and the Rural Health Care Coalition on the rural implications of the President's Health Security initiative. Continuing research will strengthen the Institute's capacity to provide timely, accurate assessments of rural policy impacts that are often unavailable to policymakers.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by these grants began in fiscal year 1991 and the appropriation for fiscal year 1991 was \$375,000. The fiscal year 1992 appropriation was \$525,000; for fiscal year 1993, \$692,000; and for fiscal year 1994, \$494,000. A total of \$2,086,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Aggregated non-federal funds to support the Rural Policy Research Institute across the three universities involved include unrecovered indirect costs, salary support from university and other non-federal sources, and various other grants, contracts, and reimbursable agreements. They amount to \$316,458 for fiscal year 1991; \$417,456 in fiscal year 1992; and \$605,302 in fiscal year 1993. Estimates for fiscal year 1994 are \$581,663.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. While the work of the Institute involves research and program experts from a number of colleges and universities, the funding is received by the University of Missouri, the University of Arkansas, and the University of Nebraska. Beginning in fiscal year 1994, Iowa State University will enter into a more formal relationship with the other three universities and explore the option of becoming a member of the consortium.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Current funding and the fiscal year 1994 proposal not yet awarded will sustain activity through September 1996.

RUSSIAN WHEAT APHID

Mr. DURBIN. Please provide a description of the research that has been funded under the Russian wheat aphid grant.

Dr. JORDAN. The research that has been funded under this grant has the goal of finding an approach or strategy that would permit

the wheat and barley growers to control or manage damaging populations of the Russian wheat aphid. The bulk of the effort is directed at development of pest resistant wheat varieties, locating and establishing biological control agents throughout the western states, and developing predictive and monitoring tools that permit growers to evade or efficiently control the pest. These major strategies are supported by numerous individual and specific research projects at each of the five state locations.

The fiscal year 1993 grants terminate between April 1994 and March 1996. The fiscal year 1994 proposals have been requested and received from the University of Idaho, Oregon State University, and Washington State University. The proposals have been reviewed and are ready to be awarded.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The Russian wheat aphid is a new pest to the U.S. infesting wheat and barley in all states west of approximately the 99th Parallel. The research being conducted under this grant addresses control under these different production and growing conditions that occur in Colorado as compared to the Northwestern states of Washington, Idaho, and Oregon. The host plant resistance work in the Northwest is in Durum wheats whereas the resistance in Colorado is in hard and soft winter and spring wheats. Idaho and Colorado are leading the work in genetic resistance in barley. Over 90 percent of America's wheat is grown west of the 99th parallel where the Russian wheat aphid has found a home. Nonchemical controls, such as host plant resistance and biological control, benefit from a collaborative effort of the scientific expertise, but must be implemented by the public sector in locally specific production and environmental circumstances.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was host plant resistance and biological control of the Russian wheat aphid. Numerous biological control agents of the aphid have been found, imported, and cleared for release. These predators and parasites of the aphid are being released in different states, under varying conditions and being evaluated for successful colonization and control. Four species of aphid parasites have become established in Washington and have killed 80–100 percent of the aphids in some areas. These parasites are being released in additional sites and additional species are being released.

Researchers seeking genetic resistance in wheats and barley have found sources of germplasm exhibiting resistance and this germplasm is in various stages of being included in production varieties. New recombinant RWA toxin resistant soft white common and club spring wheat crosses were made by the cooperating Washington State University—WSU—wheat breeder and are being advanced now through conventional bulk pedigree and another culture selections. Colorado scientists have identified molecular markers that distinguish resistant from susceptible wheats, greatly advancing the ease and speed of bioassaying advanced crosses for resistance to RWA. Strategies for monitoring of aphid flights have

been developed and are being used in a network of traps in the Northwest to inform growers if and when the aphid appears in their growing area. This alerts growers to be on guard for the need to control the pest.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$100,000; fiscal year 1990, \$346,000; fiscal year 1991, \$350,000; fiscal years 1992 and 1993, \$437,000 per year, and fiscal year 1994, \$505,000. A total of \$2,175,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The source and amount of non-federal funds by fiscal year for the participating states are as follows: from Colorado State University the state supported this project in FY92 with \$800,148 and in FY93 with \$800,411. Other non-federal funds from Colorado were \$15,000 for FY92 and FY93. State supported funds from Washington State University were \$158,377 in FY91, \$166,127 in FY92, and \$175,522 in FY93. Other support from Washington State was \$38,798 in FY91, \$33,921 in FY92, and \$31,454 in FY93. From Oregon the state supported the project with \$92,132 in FY91, \$105,536 in FY92, \$113,592 in FY93 and \$115,714 in FY94. Idaho provided state support of \$102,175 in FY91, \$164,287 in FY92, \$172,564 in FY93, and \$153,134 in FY94. Other support from Idaho was \$104,775 in FY91, \$55,926 in FY92, \$66,973 in FY93, and \$102,395 in FY94.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in Washington State University, Oregon State University, University of Idaho, University of California, and Colorado State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The fiscal year 1994 proposal indicates that the research will be completed in April 1995 for Oregon and California, 1996 for Washington and Idaho, and 1998 for Colorado.

SEAFOOD HARVESTING, PROCESSING, AND MARKETING, MISSISSIPPI

Mr. DURBIN. Please provide a description of the research that has been funded under the seafood harvesting, processing and marketing grant.

Dr. JORDAN. Research has been conducted on the evaluation of surimi made from Gulf menhaden, utilization of off-flavored catfish, and utilization of mince from commercial catfish frames. Baseline data is being compiled to aid in establishing guidelines for excess water addition to processed catfish products. This research aids in economic and product development needs.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Locally, catfish frames represent a tremendous waste product for catfish processing plants. Processing leaves about

30 percent of the meat on the frames. Selling frames to rendering plants was a breakeven situation. Nationally, Alaskan pollock, the primary species used in surimi, has been overfished on the West Coast. Minced product from catfish frames used in surimi could help alleviate the overfishing of Alaskan pollock for this purpose and increase the value of catfish frames. Gulf menhaden has fewer uses than the Atlantic menhaden and has typically been used by the fishmeal industry. Development of value-added uses for Gulf menhaden could stimulate the regional economy.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goals of this research included studying the causes and prevention of spoilage of processed catfish and the preparation and evaluation of surimi from catfish and underutilized marine species in the Gulf of Mexico. Catfish frame muscle was shown to be a high quality protein source for use as mince or in surimi. Surimi has also been successfully prepared from Gulf menhaden. The effects of washing and pH on the quality, especially color, of surimi from menhaden have been documented.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1990 and the appropriation for fiscal year 1990 was \$368,000. The appropriations for fiscal years 1991-1993 were \$361,000 per year and it is \$339,000 in 1994. A total of \$1,790,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The State of Mississippi contributed \$277,747 to this project in fiscal year 1991; \$287,555 in fiscal year 1992; \$235,253 in fiscal year 1993; and a projected \$173,403 in fiscal year 1994. Product sales contributed \$36,439 in 1991, \$53,712 in 1992, and \$19,882 in 1993. Industry grants contributed \$17,127 in 1992 and \$34,386 in 1993. Other non-federal funds contributed \$8,469 in 1991, \$5,892 in 1992, and \$24,204 in 1993. The total non-federal funds contributed to this project from 1991 through 1993 was \$1,000,629.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted by scientists in the Departments of Food Science and Technology and Agricultural Economics of the Mississippi Agricultural and Forestry Experiment Station at Mississippi State University and at the Coastal Research and Extension Center, Seafood Processing laboratory, in Pascagoula, Mississippi.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that work using fiscal year 1994 funds will be completed in 1995.

SEAFOOD RESEARCH, OREGON

Mr. DURBIN. Please provide a description of the research that has been funded under the seafood research grant.

Dr. JORDAN. The project represents a cooperative effort between Oregon State University and the Pacific Northwest seafood industry. Researchers have begun determining the optimum processing parameters for several value-added products made from Pacific whiting. The development of value-added products from the species requires identifying and adapting new technologies to minimize the enzyme-induced texture problems that currently occur with Pacific whiting products. Market evaluations of the products will be undertaken.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. After two years of decreased harvests in salmon and some groundfish species, the West Coast seafood industry is looking toward the Pacific whiting fishery to maintain healthy coastal communities and a sound fisheries industry. At present, the majority of the West Coast seafood processing industry adds little value to the harvest. Pacific whiting value-added processing, as described by this project, could revolutionize the region's seafood industry and have a significant economic impact for the coastal region. These new processes developed for Pacific whiting will be transferable to other fish species.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goals of the project are to develop new methods to circumvent the undesirable proteolytic activity that impedes the marketability of Pacific whiting, to develop new value-added products from Pacific whiting, and to conduct a market analysis of these products. Protease enzymes responsible for the tissue softening in Pacific whiting have been purified and characterized. Research has shown that the washing steps in surimi processing reduce the protease content ten-fold. Preliminary work with ohmic heating and high hydrostatic pressure processing have shown that these technologies allow for production of fishery products with high gel strength and superior texture characteristics.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993. The appropriation for fiscal year 1993 was \$327,000 and for fiscal year 1994 is \$306,000, for a total of \$633,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This project experienced initial success due, in part, to allied research funded by the Oregon Economic Development Department and the private regional seafood industry for approximately \$280,000. However, there are no non-federal funds directly listed for this grant.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the Oregon State University Seafood Laboratory in Astoria.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The investigators anticipate that funding will be requested through fiscal year 1997 to support the research.

SMALL FRUIT RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the small fruit program grant.

Dr. JORDAN. The objectives of this grant are to improve the production and quality of small fruits in the Pacific Northwest through research on cold hardiness, breeding and genetics, and pest control. The fiscal year 1993 grants terminate between August 1994 through September 1996. For fiscal year 1994, separate grants will be awarded to the Oregon, Washington, and Idaho Agricultural Experiment Stations. Fiscal year 1994 grants have been requested, but not yet received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Washington, Oregon, and Idaho are important U.S. states for growing, processing, and marketing small fruits such as strawberries, blackberries, raspberries, grapes and cranberries. To remain competitive and expand markets, research is needed to help solve the myriad of problems that occur constantly.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this project was to improve the production and quality of small fruits in the Pacific Northwest through research on cold hardiness, breeding and genetics, and pest control. Research progress to date for Oregon is the evaluation of new strawberry germplasm from Chile and North America for resistance to fruit rot, aphids, spider mites, and weevils; virus indexing of small fruit germplasm; better color stability of processed strawberries; increasing cranberry production through better weed control; and improving wine quality. Work is continuing in Washington on fruit physiology; cold hardiness of strawberries, grapes, and red raspberries; pest management of cranberries; and breeding of pest resistant strawberries. Idaho work continues on postharvest research for better marketability and adapting small fruit crops to high elevation growing conditions. For 1994, Oregon and Washington are jointly planning marketing studies to identify new market niches for berry crops and wines.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal year 1991 was \$125,000. The fiscal years 1992 and 1993 appropriation was \$187,000 per year and fiscal year 1994 is \$235,000. A total of \$734,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$1,562,078 state, \$40,933 product sales, \$62,993 industry, \$357,266 miscellaneous in 1991; \$1,465,969 state, \$90,453 product sales, \$119,164 industry, \$287, 976 miscellaneous in 1992; \$1,539,255 state, \$91,954 product sales, \$161,141 industry, \$416,712 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at Oregon State University, Washington State University and the University of Idaho with Oregon State University as the lead university.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1996.

SOIL AND WATER RESEARCH, OHIO

Mr. DURBIN. Please provide a description of the research that has been funded under the soil and water research program grant.

Dr. JORDAN. The Lake Erie research proposed in this project builds upon long-term studies of Maumee Bay initiated in 1974. The objectives of the proposed research are to determine the extent to which organic matter exports originate in small streams draining agricultural landscapes, assess the role of sediments in the water dynamics of the Bay and to determine if small managed wetlands located between the agricultural fields and the receiving streams can be effective in reducing sediments entering the Bay.

The interinstitutional agreement with Heidelberg College will strengthen the water quality monitoring and chemical analysis capabilities available to the project. The fiscal year 1993 grant supports research through July 1995. The fiscal year 1994 grant proposal has been received and is currently under review.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research focuses upon interactions between land use and a variety of aquatic systems in Maumee Basin, including wetland, river, bay and lake habitat. The work will generate fundamental information on the processes of nutrient cycling, decomposition and sediment loadings in the Maumee Basin and western Lake Erie.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The long-term objective of the research is to describe how ecosystems function and to assess the role of sediments and organic matter on the dynamics of Maumee Bay. The interaction of sediments eroded from cropland with receiving waters is a local, regional and national problem.

Since the project was awarded less than six months ago, much of the effort to date has been in procuring resources, securing staff and developing the 1994 work plan.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993. The appropriation for fiscal year 1993 was \$240,000 and for fiscal year 1994 is \$188,000 for a total of \$428,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. During the appropriate four months of work on the project, cumulative non-federal expenditures from Ohio State appropriations have been \$3,545.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted by faculty in the Biology Department at the University of Toledo in Ohio. The field location of the study is the Maumee Bay on Lake Erie.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The investigators expect to complete the field portion of the study in 1995. The fiscal year 1994 proposal is written for a two-year duration with completion in June 1996.

SOUTHWEST CONSORTIUM FOR PLANT GENETICS AND WATER RESOURCES

Mr. DURBIN. Please provide a description of the work that has been funded under the Southwest Consortium for Plant Genetics and Water Resources Program grant.

Dr. JORDAN. New Mexico State University, Los Alamos National Laboratory, Texas Tech University, the University of Arizona and the University of California at Riverside entered into a cooperative interdisciplinary research agreement constituted as the Southwest Consortium on Plant Genetics and Water Resources to facilitate research relevant to arid and semi-arid adaptation. The overall goal of the Consortium is to bring together multidisciplinary scientific teams to develop innovative advances in plant biotechnology and related areas to bear on agriculture and water use in arid and semi-arid regions. The fiscal year 1993 grant supports research through December 1994. The grant proposal for fiscal year 1994 has been received and is in the final stages of award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The Southwest Consortium for Plant Genetics and Water Resources is addressing the need for an integrated program that identifies specific problems of southwest agriculture, coordinate water and biotechnology research aimed at solving these problems, and facilitates the transfer of this information for commercialization. The specific research objectives of the Consortium include the development of crops with resistance to: drought and temperature extremes; adverse soil conditions; and pest and parasites. The Consortium is also identifying technologies for improved water and nutrient delivery.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this Consortium remains to facilitate research to provide solutions for arid and semi-arid crop adaptation. Five participating institutions have developed research plans consistent with the Consortium's goals. Sub-grants are

awarded competitively following peer review to support research that would solve problems unique to southwest agriculture. Specific attention is given to interdisciplinary agricultural research. The Consortium has discovered a gene that makes plants more resistant to water stress. They have identified a genetic marker for salt tolerance and have compared a genetic system of wild plant species to domestic crops for differences in drought response. Also, one research team has cloned a gene from alfalfa that controls an important biosynthetic pathway, while another is working out the complex metabolism of salt tolerance in resistant plant types.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1986, \$285,000; fiscal years 1987-1989, \$385,000 per year; fiscal year 1990, \$380,000; fiscal years 1991-1993 \$400,000 per year; and fiscal year 1994, \$376,000. A total of \$3,396,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The Consortium's host institution, New Mexico State University, does not report matching funds from Consortium participants. New Mexico State University does report for its portion of funded research the following non-federal funds: \$80,000 state appropriations in 1992; \$100,000 in 1993; \$100,000 in state appropriations in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by a consortium of institutions comprised of New Mexico State University, Los Alamos National Laboratory, Texas Tech University, University of Arizona, and University of California at Riverside. New Mexico State University is the lead institution.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1995.

SOYBEAN BIOPROCESSING, IOWA

Mr. DURBIN. Please provide a description of the research that has been funded under the soybean bioprocessing grant.

Dr. JORDAN. Research continues to progress on identifying new genes or gene combinations that alter the fatty acid composition or glyceride structure of soybean oil, incorporating the new genetic systems into commercially acceptable cultivars, and producing sufficient seed of the new cultivars for large-scale oil extraction, refining, and product evaluation. The research efforts are increasing genetic variation in soybeans, will lead to the development of new cultivars, and will yield oils that can be used in broad food and industrial applications in the United States and abroad.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Nutritionists indicate that humans should reduce the amounts of saturated fats and hydrogenated oil products in their diets. The research has resulted in the identification of genes

that will improve the nutritional quality of soybean oil by reducing the saturated fat content and eliminating the need for hydrogenation. The investigators are incorporating the genes into soybean varieties that can be grown commercially by farmers throughout the Midwest. The genes are available to public and private breeders to use in developing varieties for all the soybean growing regions of the United States. Uses of the modified oils for industrial applications are being investigated.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of the research was to develop and commercialize soybeans with improved nutritional qualities and new industrial applications. In 1994, more than 50,000 acres of a new variety will be grown by farmers that will produce an oil that does not require hydrogenation to achieve a high level of stability. In addition, there will be large-scale production in 1994 of a new variety with reduced saturated fat content. These will be the first large-scale productions of specialty soybean oil varieties in the world.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the fiscal year 1991 appropriation was \$200,000. The appropriation for fiscal year 1992 was \$275,000. The fiscal year 1993 appropriation was \$328,000 and it is \$308,000 in 1994. A total of \$1,111,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The project has been supported each year by the State of Iowa and industry cooperators. The non-federal State support was \$91,796 for fiscal year 1991, \$119,892 for fiscal year 1992, and \$133,609 for fiscal year 1993. Industry grants accounted for \$92,000 in fiscal year 1991, \$212,150 in 1992, and \$133,250 in 1993. It is estimated that the total non-federal funds for fiscal year 1994 are \$321,200.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. Research is being conducted at Iowa State University and various experimental farms throughout Iowa. During the winter, work that does not involve measurement of yield is done in cooperation with the University of Puerto Rico.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The research was initiated in fiscal year 1991 as a five year project. The principal researchers anticipate that the primary goals of the research will be completed in fiscal year 1995.

SOYBEAN CYST NEMATODE, MISSOURI

Mr. DURBIN. Please provide a description of the research that has been funded under the Soybean Cyst Nematode, Missouri grant.

Dr. JORDAN. Research on soybean cyst nematode is focused on incorporating or enhancing high levels of resistance to the pest in soybean cultivars. Over 10,000 plant introductions from the world collection of soybean germplasm have been tested for resistance to soybean cyst nematodes. Forty-five lines have been identified as resistant to one or more strains of the nematode and one line, PI

437654, is resistant to all known strains in the United States. These resistant lines are utilized in breeding programs to develop resistant soybean cultivars. The fiscal year 1993 award supports research through May 1995. The fiscal year 1994 proposal has been requested but has not yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The need for this research is primarily to address the serious Soybean Cyst Nematode in Missouri. However, results of this work have regional application.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The soybean breeding program has succeeded in transferring the nematode resistance in PI 437654 to the new soybean variety 'Hartwig'. This cultivar is now commercially grown and remains resistant to all known strains of cyst nematode, as well as to the root knot nematode. Genetic studies have indicated that inheritance of this resistance is complex and controlled by several genes. Several alternative resistant genes in other soybean lines have been identified and are being positioned to supplement nematode resistance in 'Hartwig' or in other varieties. Two additional soybean cultivars resistant to soybean cyst nematode were also released. The effect of crop rotations to reduce cyst nematode infestations and increase soybean yield is also under investigation.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1979, \$150,000; fiscal years 1980-1981, \$250,000 per year; fiscal year 1982, \$240,000; fiscal years 1983-1985, \$300,000 per year; fiscal years 1986-89, \$285,000 per year; fiscal year 1990, \$281,000; fiscal year 1991, \$333,000; fiscal years 1992-1993, \$359,000 per year; fiscal year 1994, \$337,000. A total of \$4,599,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$105,012 state appropriations, in 1991; \$84,368 state appropriations, in 1992; and \$168,017 state appropriations, in 1993. The Missouri Station estimates that state appropriated funds expenditures will be \$168,000 in fiscal year 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the Missouri Agricultural Experiment Station.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. According to the researchers, to more fully understand the biology of the pest and develop alternative cultivars and management strategies will require additional study through fiscal year 1998.

STEEP II—WATER QUALITY IN PACIFIC NORTHWEST

Mr. DURBIN. Please provide a description of the work that has been funded under the STEEP II—Water Quality in the Pacific Northwest grant.

Dr. JORDAN. STEEP II, which began in 1991, is the second phase of the research and technology transfer project entitled, "Solutions to Environmental and Economic Problems". Field research projects evaluate the integrated effects of tillage systems, nutrient management, pest management, crop rotation, and innovative conservation practices on wind and water erosion, crop yields, profitability, and air, water, and soil quality. These systems are evaluated for different landscape positions, crop management units, and agroclimatic zones in Idaho, Washington, and Oregon. Conservation management practices for different agroecosystems are transferred to growers through on-farm testing, newsletters, presentations by researchers at grower meetings, and through various popular scientific media. The 1993 grants terminate between April 1995 and August 1996. The 1994 grant proposals are currently under review.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Soil erosion is a serious threat to the land resources and environment in the Pacific Northwest where most of the nation's soft white wheat, peas and lentils are produced. Ten million acres of highly productive cropland suffer one of the highest potential erosion rates in the nation. Inadequate erosion control has resulted in widespread degradation of soils and is requiring farmers to increase production inputs to maintain crop yields. In addition, the erosion causes millions of dollars in off-site environmental damage in the region.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The STEEP II program is organized around three main goals to address current and emerging agricultural and environmental problems in the Pacific Northwest. These goals are: to obtain and integrate new technical/scientific information on soils, crop plants, pests, energy, and farm profitability into sustainable, whole farm management systems; to develop tools for assessing the impacts of farming practices on wind and water erosion and water quality; and to develop and implement programs for dissemination of information and transfer of technology to the farm.

New technology developed through STEEP II has helped Pacific Northwest producers to reduce soil erosion that often exceeded 100 tons per acre per year to less than 1 ton per acre per year that is well within the 1995 conservation compliance standards set forth in the Farm Bill. New farming practices have significantly reduced soil loss and improved groundwater quality. Currently, scientists are also addressing air quality as part of a new project to diminish the contribution of agricultural land to excessive levels of particulates in air pollution.

STEPP II research and on-farm testing has also provided growers with management options for weed and disease control in win-

ter wheat that maintain profitability and meet conservation compliance on the steep, highly erodible farmlands of the Pacific Northwest states. New cereal crop breeding and cultural practices research has reduced crop damage from leaf spot disease by 10 percent. Genetic and breeding studies have resulted in new wheat genotypes with superior resistance to Root rot diseases, Russian wheat aphid and other major pests. STEEP II has also provided growers with options to reduce herbicide rates for weed control through use of longer crop rotations, closer scouting of weeds, and by managing for healthy crops. Multidisciplinary economic-ecologic modeling of highly erodible watersheds has provided much needed estimates of the on-site and off-site economic damage impacted by conventional farming practices. Emerging results will provide farmers ways to manage Conservation Reserve Program lands after contracts expire for successful conversion of these lands into sustainable agriculture and other uses. STEEP II has also initiated research that paves the way for analyzing the impacts of wind erosion from agricultural lands on rural and urban air quality in the Columbia Plateau and developing control practices to reduce dust emissions from susceptible croplands.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991, and the appropriations for fiscal years 1991-1993 are \$980,000 per year; and it is \$921,000 in 1994. A total of \$3,861,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$938,812 state appropriations, \$63,954 product sales, \$156,656 industry, and \$16,994 miscellaneous in 1991; \$1,025,534 state appropriations, \$75,795 product sales, \$124,919 industry, and \$88,696 miscellaneous in 1992; \$962,921 state appropriations, \$62,776 product sales, \$177,109 industry and \$11,028 miscellaneous in 1993; and \$1,069,396 state appropriations, \$46,582 product sales, \$169,628 industry, and \$22,697 miscellaneous in 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work under STEEP II will be done at field research sites, farmers' fields, and laboratories in Idaho, Washington, and Oregon.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The original STEEP program was a 15-year program, initiated in 1975 and completed in 1991. The new STEEP II Program was started in 1991, with the first phase planned to extend for five years.

SUNFLOWER INSECTS, NORTH DAKOTA AND SOUTH DAKOTA

Mr. DURBIN. Please provide a description of the research that has been funded under the Sunflower Insects grant.

Dr. JORDAN. The North Dakota and South Dakota Agricultural Experiment Stations continue short and long term research to manage sunflower insects.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. During the last ten years, North Dakota has been the center for sunflower culture, annually producing over 65 percent of the nation's sunflower. In North Dakota, sunflower growers consider insect pest problems their major production problem. This research program addresses this regional issue.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research as to provide short term and long term solutions to sunflower insect problems. Short term research focused on insecticides and planting dates to minimize insect losses. Long term solutions focuses on enhanced natural controls. The 1994 proposal from North Dakota addresses the banded sunflower moth and the red sunflower seed weevil. South Dakota has a three-year study to evaluate and improve insect resistance in sunflowers. Past research at North Dakota has shown that certain sunflower accessions are more attractive to red sunflower seed weevil adults than a standard hybrid. The preference of adult red sunflower seed weevil to certain plant stages contributes to an aggregated distribution of adult weevils to plant stages, regardless of locations and cultivars. Larval feeding of the red sunflower seed weevil has been found to reduce kernel weight, and also results in lowered oil concentration. Another insect, the sunflower midge, has been found to induce an elevation in plant auxins causing growth deformity. Results of research at South Dakota suggest that transgenic plants may be obtained from microinjected ovules, but at a low rate. Preliminary data indicate that regeneration efficiency may be improved by the use of multiple embryogenesis and/or shoot proliferation systems.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1982, \$72,000; fiscal year 1983, \$80,000; fiscal years 1984-1985, \$150,000 per year; fiscal years 1986-1989, \$190,000 per year; fiscal year 1990, \$188,000; fiscal year 1991, \$194,000; fiscal years 1992 and 1993, \$200,000 per year, and fiscal year 1994, \$141,000. A total of \$2,135,000 has been appropriated. Approximately 25 percent of the funds have been allocated to South Dakota.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. In fiscal year 1993 North Dakota expended \$162,979 on this project, \$159,726 from state appropriated funds and \$3,253 from industry grants. In South Dakota fiscal year 1993 non-federal funds totaled \$27,254 and broke out to \$24,583 state appropriations, \$207 product sales and \$2,465 from industry.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the North Dakota and South Dakota Agricultural Experiment Stations.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The 1994 proposal from North Dakota for research on banded sunflower moth and the red sunflower seed weevil is for 3-years, 1994 to 1997 on defined objectives and procedures. South Dakota's proposal is for the period July 1993 to July 1996.

SUSTAINABLE AGRICULTURE, MICHIGAN

Mr. DURBIN. Please provide a description of the research that has been funded under the Sustainable Agriculture program grant.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received.

Mr. DURBIN. According to the principal investigator, what is the national, regional or local need for this research?

Dr. JORDAN. The national, regional, or local need for this research will not be known until the proposal is received.

Mr. DURBIN. Where will this work be carried out?

Dr. JORDAN. Research will be conducted at Michigan State University.

SUSTAINABLE AGRICULTURE AND NATURAL RESOURCES, PENNSYLVANIA

Mr. DURBIN. Please provide a description of the research that has been funded under the Sustainable Agriculture and Natural Resources program grant.

Dr. JORDAN. Pennsylvania State University has conducted a local competitive grants program for this project. Research involves nutrient cycling in vegetable production systems, on-farm compost production and utilization, and integrated pest management for apple production. The fiscal year 1993 grant supports this research through June, 1995. Competition is currently underway to identify research which will be funded by the fiscal year 1994 grant.

Mr. DURBIN. According to the research proposal, or the principal investigator, what is the national, regional, or local need for this research?

Dr. JORDAN. The research is directed toward problems encountered in Pennsylvania.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The project began in 1993. The goal is to enhance the economic viability of Pennsylvania agriculture in an environmentally sound manner. Manure and compost from dairy and poultry have been evaluated in greenhouse studies and on three farms. Both manures were consistently higher in total nitrogen, organic nitrogen, and total phosphorous, and the carbon to nitrogen ratio was lower as compared to compost. Corn receiving manure, compost and/or nitrogen and phosphorous fertilizer had variable yields in the first year of study. Preliminary results of the integrated pest management/apple research indicate that pheromone disruption ties were not totally effective in controlling the codling moth; however moth capture in the trial was substantially less than in surrounding orchards. Root growth response of bell peppers to organic

amendments was largely influenced by the availability and form of nutrients in each amendment.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993. The appropriation for fiscal year 1993 was \$100,000 and \$94,000 in 1994 for a total of \$194,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. No information has been provided about matching funds.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at Pennsylvania State University and with cooperators throughout Pennsylvania.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Research funded by fiscal year 1993 funds will be completed in 1995; however, the completion date for fiscal year 1994 funds will not be known until projects are selected for funding and the proposal is received by CSRS.

SUSTAINABLE AGRICULTURE SYSTEMS, NEBRASKA

Mr. DURBIN. Please provide a description of the research that has been funded under the Sustainable Agriculture Systems program grant.

Dr. JORDAN. The fiscal year 1993 grant supports research through March 1994. The 1994 proposal has been received and is being reviewed. The global objective of the 1994 project is to investigate and develop management strategies that will increase the biological and economic efficiency of farming systems that integrate cropping and livestock production on farm or in a watershed. A second broad objective of the project is to organize and locate five regional research projects in locations where they can provide sites for educational activities, for college and younger students, for adult extension audiences, and others.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research would have local and possibly regional impacts.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this project is to develop management strategies that will increase the biological and economic efficiency of farming systems.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992 and the appropriation for fiscal years 1992 and 1993 was \$70,000 per year. \$66,000 was appropriated for fiscal year 1994. A total of \$206,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The matching funds dedicated to this research includes state funds in the amount of \$25,313 in fiscal year 1992, \$26,384 in fiscal year 1993, and \$27,306 in fiscal year 1994. A total of \$79,003 has been provided in state funds as matching.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by the University of Nebraska at five locations across the State.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work will be completed in fiscal year 1994. It is anticipated that this 3-year project will catalyze other sources of long-term funding.

SWINE RESEARCH, MINNESOTA

Mr. DURBIN. Please provide a description of the research work that has been funded under the swine research program grant.

Dr. JORDAN. The Swine Center at the University of Minnesota has funded research projects identified by a university/industry strategic planning process to address problems important to the swine industry of the State. An internal review process is established to assess the need and scientific merit of proposals developed by the University of Minnesota faculty. Projects were funded in 1993 to investigate the: effectiveness of technology transfer through area-based pork producer alliances in the control of pseudorabies virus spread among state herds; use of early weaning on growth factors; use of a swine production information system to determine the contribution of facility utilization to herd production; role of antibody in Porcine Reproduction and Respiratory Syndrome virus infection; metabolic connections between nutrition and sow performance with emphasis on amino acids; and milk production levels on the efficiency of dietary lysine conversion into milk proteins. The fiscal year 1993 grants support research through May 1994. Fiscal Year 1994 grant proposals have not been received for review by CSRS scientists.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The research addresses problems identified within the state.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to encourage interdisciplinary research among scientists to address a number of problems impacting the swine industry. The grant has provided support to projects that have produced research results that improve environmental management practices in confined units, strategies that use medicated early weaning practices in the rearing of pigs, and improved nutrient management practices for the swine herd.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded through appropriated funds as follows: \$140,000 per year for fiscal years 1992 and 1993; \$132,000 in 1994. A total of \$412,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$160,694 State appropriations, \$216,495 industry, and \$25,800 from other non-federal appropriations in 1992; and \$192,206 State appropriations and \$200,291 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Minnesota Swine Research Center.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The efforts are proposed to be completed in fiscal year 1997.

TROPICAL AND SUBTROPICAL RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the tropical and subtropical research program grant.

Dr. JORDAN. CSRS is operating the program in coordination with the Caribbean Basin Administrative Group—CBAG—and the Pacific Basin Administrative Group—PBAG. State Agricultural Experiment Stations that are members of CBAG are Florida, Puerto Rico, and the Virgin Islands; members of PBAG are Hawaii and Guam.

Non-member institutional interests are represented by the Executive Director of the Southern Region Agricultural Experiment Station Directors, who is a member of CBAG, and the Executive Director of the Western Region Agricultural Experiment Station Directors, who is a member of PBAG. The Agricultural Research Service—ARS—also has representation on CBAG and PBAG.

Funds for the program are divided equally between the two Basin Administrative Groups. The research objective of the program is to improve the agricultural productivity of many of the subtropical and tropical parts of the United States. Special research grants have been awarded, using a peer review and competitive process, for research on controlling insect, disease and weed pests of crops; increasing the production and quality of tropical fruits, vegetables and agronomic crops; promoting increased beef production through development of superior pastures; detection of heartwater disease of cattle and the influence of heat stress on dairy cattle reproduction; better use of land and water resources; and potential for growing new speciality crops.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The local and regional need for this research was to increase the food production capability of these U.S. tropical and subtropical areas. Some of these areas like Guam, Puerto Rico, and the Virgin Islands import most of their food while Florida and Hawaii need to produce economically many food products for export.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research was to increase the production and quality of tropical crops; control pests and dis-

eases of plants and animals; promote increased beef production and conserve land and water resources. In fiscal 1993, a total of 79 grants were awarded with 40 grants being awarded by CBAG and 39 grants being awarded through PBAG. Examples of research being funded are the use of biotechnology to control fruit tree diseases; genetic engineering of papaya to obtain virus resistance; genetic engineering of papaya for extended postharvest shelf life. Other examples of new research being funded are production of taro in former sugarcane fields; examining the papaya root system for improved yields; control of virus diseases of cucurbits in tropical areas; control measures for viruses and other diseases of taro, cocoyam and other aroids; control of thrips on melons; breeding and biotechnology for forage yield, quality and persistence in the tropics; improved reproduction of dairy cows; pigeon peas and weed management in tomatoes and peppers; and economic analysis of recirculating systems for raising fish.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The operation of the tropical and subtropical research program was transferred from ARS to CSRS, with CSRS funding being first provided in fiscal year 1983. Funds in the amount of \$2,980,000 per year were appropriated in fiscal years 1983 and 1984. In fiscal year 1985, \$3,250,000 was appropriated. In fiscal years 1986, 1987, and 1988, \$3,091,000 was appropriated each year. \$3,341,000 was appropriated in fiscal year 1989. The fiscal year 1990 appropriation was \$3,299,000. The fiscal years 1991-1993 appropriations were \$3,320,000 per year; and \$3,121,000 in 1994. A total of \$38,204,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. For fiscal year 1991, \$3,249,608 of non-federal funds were provided to the tropical and subtropical program. Of the total, \$3,023,219 were state appropriations, \$87,892 were product sales, \$109,122 were industry grants and \$29,375 came from miscellaneous sources. For fiscal year 1992, \$2,875,213 of non-federal funds were provided. These funds came from state appropriations of \$2,652,781, product sales of \$48,105, industry grants of \$89,803, and \$84,524 from miscellaneous sources.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in Florida, Puerto Rico, Virgin Islands, Hawaii, and Guam.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The scientists have not established a termination date.

TAXOL CULTIVATION

Mr. DURBIN. Please provide a description of the work that has been funded under the taxol cultivation grant.

Dr. JORDAN. The overall objective of this program is to stimulate commercial use of ornamental yew biomass as a source of taxanes. The Taxus biomass may be obtained both from "taxane specific" Taxus cultivation as well as from yew prunings, currently consid-

ered waste material at nurseries. The goal of the current phase of the program is enhancement of taxane biosynthesis through application of certain chemicals to *Taxus* plants. This will be done in both greenhouse and in field plantings.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. Cultivation of plant material for this pharmaceutical as well as landscape value may contribute to sustainable agriculture in the Northeast.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. This work contributes to the goal of establishing *Taxus* needle biomass from ornamental cultivars as an alternative and to supplement the source of taxol for antineoplastic uses. It will provide data in support of additional commercial markets for taxanes. A possible outcome is that this work will stimulate serious pursuit of "farmaceuticals", compounds derived from plants cultivated specifically for their medicinal, industrial, and agricultural applications. This would contribute to "sustainable agriculture" in the Northeast.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$47,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal years?

Dr. JORDAN. In fiscal year 1994, the initial year of this project, \$51,423 is to be provided by the State of Connecticut for Taxol research.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the Connecticut Agricultural Experiment Station, New Haven, Connecticut.

Mr. DURBIN. When do the principal researchers anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that work may be completed in fiscal year 1998.

TILLAGE, SILVICULTURE, WASTE MANAGEMENT, LOUISIANA

Mr. DURBIN. Please provide a description of the research that has been funded under the tillage, silviculture, waste management research grant?

Dr. JORDAN. CSRS has requested the University to submit a grant proposal that has not as yet been received. The program manager and the principal investigator have conversed. The program will be conducted by a multidisciplinary team.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The applications of the results of this research will be national in scope. The need is dependent on the site. There are many areas throughout the nation where the waste problem can be ameliorated by land application.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The research proposal has not, as yet, been received by CSRS. Telephone conversations provide some information. This is a multidiscipline program aimed at defining procedures to increase production of both agriculture and forest crops and to examine the use of waste materials in this production. This program received initial funding in fiscal year 1994. Development of a plan of work and assignment of duties are presently being outlined.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$235,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. We have no information at this time regarding non-federal funds.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at The Louisiana State University, Agricultural Research Center.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work may be completed in fiscal year 1996.

URBAN PESTS, GEORGIA

Mr. DURBIN. Please provide a description of the research that has been funded under the urban pests program grant.

Dr. JORDAN. This research concentrates on establishing criteria and designing strategies for the management of household and structural insect pests. The principal focus is on termite and ant pests. The research effort will determine pertinent activities and dynamics of the pests, assess the biological activity of alternative and conventional control agents, evaluate control agent and delivery system efficacy in population regulation, and monitor the environmental fate of these control agents. The fiscal year 1993 grant supports research through March 1994. The fiscal year 1994 grant will support research through March 1995.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Given the potential cancellation of pesticide registrations for control of household and structural pests, this research could address national concerns.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. This research focuses on the management of household and structural pests; specifically termites and ants. The first recorded incidence of Formosan termite infestations in the Atlanta metro area were identified in 1993 by program researchers. Monitoring programs have been established to predict future infestations. Subterranean termite colonies have been characterized and data established that *Reticulitermes flavipes* and *R. virginicus* can enter a quiescent state to survive complete submersion in rising ground water. Commercial termiticides have been tested and shown to bind to soil particles thus reducing their effectiveness. Research regarding foraging behavior and termite control tactics

using bait strategies is underway. Efficacy testing of three different baits show termite mortality in field tests. Foraging behavior tests in the lab show that termites examine food quality and quantity and the distance from their nest when selecting a feeding site. Research on the Argentine ant has shown low pesticide input strategy using containerized ant baits to be effective in controlling late season high density ant populations.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The research supported by this grant began in fiscal year 1991, and the appropriation for fiscal years 1991–1993 was \$76,000 per year. In fiscal year 1994 the appropriation is \$71,000. A total of \$299,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant by fiscal year were as follows: 1991—none; 1992—\$26,020; 1993—\$8,100 state appropriations, \$20,000 industry, and \$30,000 miscellaneous. Non-federal funds for fiscal year 1994 are zero dollars to date.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is underway at the Georgia Agricultural Experiment Station at Griffin, Georgia.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The current objectives on termites and ants will require an additional year to complete.

VALUE ADDED WHEAT PRODUCT DEVELOPMENT PROGRAM—KANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Value Added Wheat Product Development program in Kansas.

Dr. JORDAN. The goal of this project is to increase the utilization of wheat in food and nonfood applications. Industrial partners are being identified for each project. Initial targets include: identity preserved wheat; industrial applications for wheat; hard winter wheat for noodles; and healthier wheat containing snacks.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this goal?

Dr. JORDAN. Kansas is the leading producer of wheat and new value added uses are needed to expand wheat markets and improve economics for Kansas and regional wheat growers.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Funding under this project has not yet been received but this work is an expansion of ongoing research funded by the Kansas Wheat Commission and Kansas Value Added Center.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The funding for fiscal year 1994 is \$235,000. Work outlined under this project is not yet underway.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Since this is a new grant, the amount of non-federal funds available in 1994 is not yet known.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. This work is conducted by Kansas State University Agricultural Experiment Station and the Department of Agricultural Economics and Department of Grain Science and Industry. Industrial cooperators have been identified in several areas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The project is phased through 5 years. Each product objective will require about 6 months of market research and 18 months or longer of development time. Thus, there will be a series of partial completions beginning late in the second year and continuing throughout the project.

WASTE UTILIZATION, NORTH CAROLINA

Mr. DURBIN. Please provide a description of the research that has been funded under the Waste Utilization research grant.

Dr. JORDAN. CSRS has requested the University to submit a grant proposal that has not as yet been received.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Waste is a national problem. Application of the results of this study should be applicable throughout the country.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal is to provide management information to both producers and probable consumers as to the processes and products of waste utilization. Assignment of duties and the recruitment of graduate students are the first chores to be accomplished. Presently, a research plan is being developed. It will be reviewed prior to release of funds.

Mr. DURBIN. How long has this work been underway and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. The proposed work has just been initiated in fiscal year 1994. The 1994 appropriation is \$414,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Information about the non-Federal funds for this fiscal year is not yet available.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at The North Carolina State University, Department of Biological and Agricultural Engineering.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work may be completed in fiscal year 1996.

WATER CONSERVATION, KANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the water conservation program grant.

Dr. JORDAN. Field studies were conducted at Colby and Garden City, Kansas in 1993 to evaluate the water requirements of sub-surface drip-irrigated corn. An advanced study was initiated at Colby to evaluate water use efficiency and crop water stress. Extremely wet weather during the growing season limited progress on these studies. A system longevity study was not affected by weather conditions. The fiscal year 1993 grant supports research through May, 1994. The fiscal year 1994 grant proposal has been received and is under review for award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Corn is the principal irrigated crop in Kansas. This research will be of significance within the State and nearby areas.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The research goal is to determine the feasibility of drip irrigation in western Kansas to sustain irrigated corn production to support the beef feedlot industry. The project also supports an educational effort through collection and dissemination of information on efficient irrigation methods.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1993 with \$94,000 and \$88,000 is available in 1994. The total funds appropriated are \$182,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$781,232 state appropriations, \$55,205 product sales, \$60,907 industry and miscellaneous in 1991; \$868,408 state appropriations, \$37,543 product sales, \$35,484 industry and miscellaneous in 1992; \$833,324 state appropriations, \$54,964 product sales, \$144,225 industry and miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at Kansas State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers have projected five years of data collection with completion of the project in 1998.

WATER CONSERVATION, NEVADA

Mr. DURBIN. Please provide a description of the research that has been funded under the Water Conservation program grant.

Dr. JORDAN. Work under the Water Conservation project in Nevada was initiated in September 1992. The research is being conducted on land made available by the city of North Las Vegas. The purpose of the research is to determine if urban wastewater can be used as an alternative irrigation source. Grasses will be grown on the research plots with irrigation from a reservoir. The status of

salinity and crop growth will be monitored. The initial grant was written with a completion date of September 30, 1996.

The fiscal year 1993 grant supports research through September 1996. The 1994 grant proposal has been received and is being processed for award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Water is a precious resource, especially in arid regions. Cities, such as Las Vegas, NV, produce large quantities of wastewater. There is a local and regional need to find beneficial uses for these urban wastewaters. Irrigation provides a potential beneficial use for wastewater. Results from this research should be applicable to the local situation and other areas where water is in limited supply.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The goal of this project is to develop Best Management Practices—BMPs—for utilization of wastewater as an irrigation source. Utilization of wastewater in irrigation could free up large quantities of fresh water for higher priority uses.

Accomplishments to date include installation of a weather station at the field site and climatological data is being collected on an hourly basis. Soil samples have been taken to determine initial water content and the distribution of soluble salts. All lysimeters have been installed and the irrigation cells were planted to tall fescue. The reservoir and irrigation system have been completed and prepared for the irrigation season. Plant and soil measurements on the research cells will be initiated in February, 1994.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1992. Funds appropriated for fiscal years 1992 and 1993 were \$200,000 per year; and \$188,000 in 1994. A total of \$588,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$13,200 state appropriations, and \$63,000 industry in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the University of Nevada, Las Vegas, in cooperation with the city of North Las Vegas.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigators have stated that the project will require five years to complete. The field work should be completed in 1996.

WATER MANAGEMENT, ALABAMA

Mr. DURBIN. Please provide a description of the research that has been funded under the Water Management, Alabama grant.

Dr. JORDAN. Objectives of the current research effort in Water Management in Alabama are to: determine the effects of forest harvest, site preparation and reforestation on the water quality of small watershed streams; determine the contamination and surfactant-enhanced cleanup of the subsurface of organic liquids heavier and lighter than water; determine the effectiveness of a constructed wetland system to manage swine lagoon effluent; determine factors to include agricultural water management practices among states; and assess the bioavailability of nitrogen and phosphorus in poultry waste and their utilization as plant nutrients and as possible sources of water contamination.

The fiscal year 1993 grant supports research through August, 1996. The funds allocated in 1993 were used to support research on the effect of landfill waste on water quality, to continue investigations on reducing non-point source water pollution from agricultural and forestry production, and the harvesting and storing of water for irrigation. The Cooperative State Research Service is currently reviewing the proposal from Auburn University for 1994 funds.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. This proposal addresses a number of needs to reduce potential non-point source pollution of water sources in Alabama and adjacent states with similar soils, and agricultural and forestry management systems.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this research is to better understand and provide solutions for a range of major water management and environmental quality concerns facing farmers and rural communities in Alabama and surrounding states. These concerns range from effects of intensive forest and agricultural management practices on water quality and the need for best management practices, to methods of cleanup of chemical spills and multi-state planning to better manage water resources among increasingly competitive uses.

Results of previous research have demonstrated that application of broiler litter above the recommended rate resulted in an accumulation of ammonium and nitrate nitrogen in the soil. Soil characteristics and conditions were shown to be important in the proper use of nutrients from broiler litter. The capacity of soils to absorb phosphorus from poultry litter increased with increasing clay content. Management practices for utilizing broiler litter as a fertilizer must consider the balance between nutrient content and utilization to protect the groundwater. Research initiated to investigate below-ground aspects of agroecosystems as affected by elevated atmospheric carbon dioxide showed that changes in the nitrogen concentration of both plant and soil samples, as well as changes in the nitrogen concentration of soil solution samples, were due to elevated atmospheric carbon dioxide.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$300,000; fiscal year 1990, \$395,000; fiscal year 1991, \$397,000; fiscal years 1992 and 1993, \$398,000 per year; fiscal year 1994, \$374,000. A total of \$2,262,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$91,938 state appropriations, \$9,643 product sales, \$8,147 miscellaneous in 1992. No non-federal funds were reported by Auburn University for this grant in fiscal years 1991 or 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Auburn University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that some of these research studies will be completed during fiscal year 1996, with the rest of the project to be completed in fiscal year 1997.

WATER QUALITY

Mr. DURBIN. Please provide a description of the research that has been funded under the Water Quality special research grants.

Dr. JORDAN. The Cooperative State Research Service continues support to a special research grants program in water quality as part of the Department of Agriculture's Water Quality Initiative. This program supports a national competitively-selected, special grants program to conduct research to better understand the impacts and develop controls of non-point source pollution from agriculture on water quality, and to develop improved, sustainable agricultural practices and systems that protect the environment and are economically profitable. Also, this program supports research on five Management Systems Evaluation Areas as part of the Midwest Initiative on Water Quality, with research located at 10 sites throughout the Corn Belt, to develop new farming systems that protect water quality. This program is conducted jointly with the State Agricultural Experiment Stations, Agricultural Research Service, U.S. Environmental Protection Agency, U.S. Geological Survey, Extension Service, Soil Conservation Service, and other federal, state, and local agencies.

In fiscal year 1993, the request for proposals in the Water Quality Special Research Grants Program resulted in 239 grant proposals received. The peer review panels awarded funding to 47 proposals for a 20 percent success rate. In addition, second year funding was awarded to 25 nitrogen testing grants and the Management System Evaluation Areas—MSEA—in the Midwest were awarded funds. A total of 83 grants were made with awards ranging from \$3,200 to \$360,000 for a funding period up to three years.

The Request for Proposals for the fiscal year 1994 Special Grants Program in Water Quality is currently being prepared. A complementary program in "Water Resources Assessment and Protection" is also being conducted under the CSRS National Research Initiative Competitive Grants Program in fiscal year 1994.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. With the major advances of agricultural science and technology in recent decades to improve our standards of living, agricultural chemicals have played a key role in improving the efficiency and productivity of agriculture. However, many concerns have been raised by the public about the possible risks to the environment and soil and water quality by the use of these chemicals. Better methods of detection of very minor amounts of chemicals in water have made the public, farmers, and policymakers more concerned about use and management of these agricultural chemicals and wastes, while meeting the challenge of maintaining the efficiency and productivity of agricultural production systems.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goals of the CSRS Special Research Grants Program in Water Quality were to: determine the extent to which agriculture has impacted groundwater quality; and to develop new and improved and cost-effective agricultural systems that enhance ground water quality. Major progress has already been made on these goals. Examples of some of the results of recently completed research include the following:

Recommended practices for animal waste management—New and improved handling methods, proper timing and recommended rates of application of animal manures and poultry litter to farmland have reduced both surface water contamination for runoff, and decreased the risk of leaching to cause groundwater pollution.

Remediation methods to detoxify pesticides or toxic pollutants—Researchers have developed new microbial transformation methods to reduce high levels of selenium in western irrigation drainage waters; and have developed an inexpensive method using immobilized microbial cells for on-site detoxification of pesticide residues.

Riparian buffer strips to reduce water pollution—Constructed multi-species riparian buffer strips have been shown to be effective in trapping sediments in runoff from agricultural cropland, in reducing nitrate levels from 25 to less than 4 parts per million in surface runoff, and in increasing bird and wildlife populations.

Improved irrigation and watershed management—Research and extension specialists have developed economic incentive programs based on blockrate pricing for irrigation water that motivate improvements in water management and reduce drainage water volumes in western water districts. Midwestern scientists have developed a prototype watershed-level economic model that incorporates both Geographic Information System and water quality factors for use in watershed planning.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. The work under the Water Quality Program began in fiscal year 1990 with an appropriation of \$6,615,000. The fiscal year 1991 appropriation was \$8,000,000; the 1992 appropriation was \$9,000,000; the 1993 appropriation was \$8,950,000; and the 1994 appropriation is \$4,230,000. A total of \$36,795,000 has been

appropriated for Special Research Grants on water quality. In addition, \$3 million was appropriated in fiscal year 1989 for groundwater research.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$605,118 state appropriations, \$30,590 product sales, \$2,469 industry, and \$215,915 miscellaneous in 1991; \$861,277 state appropriations, \$1,061 product sales, \$7,189 industry, and \$278,713 miscellaneous in 1992. Data on non-federal funds provided for fiscal years 1993 and 1994 are not yet available.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The awards under the national competitively-selected Water Quality Special Research Grants Program in FY 1994 may be made in any State, and will be based on selected research problem areas. The Management Systems Evaluation Areas of the Midwest Initiative on Water Quality are headquartered in Iowa, Minnesota, Missouri, Nebraska, and Ohio, with satellite locations in North Dakota, South Dakota, and Wisconsin.

Mr. DURBIN. When do the principal researchers anticipate that this research will be completed?

Dr. JORDAN. The researchers funded under the Water Quality Special Grants Program have shown significant progress on improved understanding of the impacts of agricultural practices on surface and ground water pollution, and in developing improved agricultural systems that are sustainable both economically and environmentally. Implementation of some of these recommended new practices is already underway in a number of states, while the evaluation of their effectiveness on water quality may, in some cases, require up to 15 to 20 years, to obtain definitive results. Some of the more applied research water quality special grants may be completed within 3 to 5 years, while more comprehensive or basic research projects will require another 5 to 10 years to complete the work in progress.

WHEAT GENETICS, KANSAS

Mr. DURBIN. Please provide a description of the research that has been funded under the Wheat Genetics, Kansas Special Grant.

Dr. JORDAN. This project provides partial support for the Wheat Genetics Resources Center at the University of Kansas, which focuses on collection, evaluation, maintenance and distribution of exotic wheat related germplasm.

Mr. DURBIN. According to the research proposal or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Most cultivated varieties of wheat are derived from common sources. They lack the rich genetic diversity needed to develop resistance to diseases, insects and environmental stress. The replacement of genetically rich primitive cultivar and land races by modern, more uniform cultivars all over the world is causing erosion of wheat germ plasm resources. New pests or those that have overcome varietal resistance pose a constant threat to the nations wheat production. Genetic resistance often resides in wild relatives of wheat. This program which was established in Kansas is providing service to wheat breeders nationwide.

Mr. DURBIN. What was the original goal of this research and what has been accomplished?

Dr. JORDAN. The original goal of this research was to enhance the genetic diversity available to wheat breeders nationally and internationally by collecting, evaluating, maintaining and distributing germ plasm derived from wild relatives of wheat. To date twenty five germ plasm releases containing new genes for such pests as Hessian fly, greenbug, leaf rust, soilborne mosaic virus and Russian wheat aphid. Germ plasm stocks with resistance to leaf rust and powdery mildew are under development. Evaluation of germ plasm for important resistance genes was carried out by Center scientists and cooperating institutions.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Work supported by this grant began in fiscal year 1989. Appropriations were, for fiscal year 1989, \$100,000; fiscal year 1990, \$99,000; fiscal year 1991, \$149,000; fiscal years 1992-1993, \$159,000 per year; and fiscal year 1994, \$196,000. A total of \$862,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds provided for this grant were as follows: \$493,285 state appropriations, \$31,414 product sales, and \$84,610 miscellaneous in 1991; \$414,822 state appropriations, \$14,259 product sales, and \$102,086 miscellaneous in 1992; and \$533,848 state appropriations, \$32,297 product sales and \$163,937 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at Kansas State University by the Wheat Genetics Resource Center.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. This project was projected to run for 10 years and therefore, would continue through fiscal year 1998.

WOOD UTILIZATION RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the Wood Utilization research grant.

Dr. JORDAN. The program was re-focused in 1992 to: meeting environmental objectives in timber harvesting and products manufacture; extending the timber resource through new and improved product development, processing and protection; developing new and improved structural applications for wood; and exploiting wood chemical extractives for pesticides, preservatives, adhesives and pharmaceuticals. Projects funded with fiscal year 1994 funds will be the first cycle in which the refocusing can occur fully.

The fiscal year 1992 grants terminate between January 1993 and April 1996. The fiscal year 1993 grants terminate in 1997.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is national, regional, or local need for this research?

Dr. JORDAN. The research being done in the regions on specific species groups is generally directly applicable to species, technology, processes, and science in the other regions. Locally, the applications are tailored to specific site or plant needs. The results of the research benefit the resource and, therefore, the environment.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The original goals were to provide studies in; Harvesting and transportation, timber manufacturing and processing, wood-based composite materials, structural engineering, protection and preservation of wood, wood chemistry, and economic evaluation and technology transfer. A review of the program was conducted in 1992, and these goals changed to reflect the progress made during the previous years and the emphasis of the impact on the environment. Specifically the new goals are: Meeting environmental objectives in timber harvesting and products manufacturing; Extending the timber resource through new and improved product development, processing, and protection; Developing new and improved structural applications for wood; and Exploiting wood chemical extractives for pesticides, preservatives, adhesives, and pharmaceuticals.

Each of the participating institutions has developed programs that have resulted in savings of the resources and efficiencies that have translated into reduced manufacturing costs, thus lower product cost. In addition, each program has supported graduate students that will become the new cadre of researchers. Examples of research are: bioremediation of hazardous materials techniques has reduced the cost ten times that of other procedures and returned land to productive use; and the continued effort to use lasers to cut lumber has been proven to be economical. A system has been demonstrated that reduces raw material needs by 15 percent; plans are to move this technology to the furniture industry this year; and simulations of wood processing, i.e., sawmills, particleboard, and plywood plants, have been developed that aid in the decisions regarding expenditures for machinery, raw material requirements, machine locations, and systems operations. These simulations have been verified and installed in industry. Each of the above illustrate just a few of the ongoing projects, each of which would not have been accomplished without the support of this grant, and each of which have returned annually manyfold the appropriation.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, \$3,000,000; fiscal year 1986 through fiscal year 1989, \$2,852,000 per year; fiscal year 1990, \$2,816,000; fiscal years 1991 and 1992, \$2,852,000 per year; fiscal year 1993, \$4,153,000; and fiscal year 1994, \$4,176,000. A total of \$31,257,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Mississippi State University non-federal funds were: State appropriations \$2,498,800, \$2,178,725, and \$2,353,225 for 1991, 1992, and 1993 respectively; and industry and other source grant funds of \$795,560, \$1,287,016, and \$333,316 for these same years. Oregon State University state appropriations were: \$1,337,962, \$1,394,304, \$1,338,604, and \$1,256,750 for 1991, 1992, 1993, 1994 respectively. We only have the data for the current year (1994) from Michigan State which is \$910,481 non-federal funds. Data for three recent participants (1994) are: University of Minnesota-Duluth non-federal match is \$590,000; North Carolina State

University non-federal contribution to this program is \$126,606; and the University of Maine non-federal match for 1992 was \$600,000.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Three universities have had principal responsibility for the program. Two universities were added in 1993, the University of Maine and the North Carolina State University. In 1994, the University of Minnesota-Duluth became the sixth university active in this program. Oregon State University, College of Forestry, has research ongoing in the western conifers; Mississippi State University, School of Forest Resources, is working with southern pines; and Michigan State University, Department of Forestry, is coordinating research dealing with eastern hardwoods in cooperation with researchers at two other universities. Scientists at the University of Maine, College of Forest Resources, in collaboration with researchers at the University of Vermont and the University of New Hampshire are working with the forest resource in the New England states. North Carolina State University, College of Forestry Resources, has a innovative program in the machining of wood. Added this year is the incubator program at the University of Minnesota-Duluth. In addition, work is being conducted at Louisiana State University, SUNY-College of Environmental Sciences and Forestry, and The Pennsylvania State University through 30 month grants made in 1993.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work may be completed in fiscal year 1998.

WOOL RESEARCH

Mr. DURBIN. Please provide a description of the research that has been funded under the wool research grant.

Dr. JORDAN. The overall goals for this research are the development of objective measures of wool, mohair, cashmere and other animal fibers to increase profitability of the sheep and Angora goat industries. Specific objectives include: develop and evaluate measurement techniques for rapid objective evaluation of wool, mohair, cashmere and other animal fibers; use objective measurements to increase fiber production, quality and income to producers; and investigate commercially acceptable methods of producing high yields of wool grease containing low levels of pesticides. The fiscal year 1993 grants terminate between August 1994 and January 1997. The fiscal year 1994 grants have been received and are currently being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Collaboration exists among researchers in Texas, Wyoming and Montana associated with this grant and other Federal, university and industry scientists on a wide basis to assure responsiveness to the needs of those involved in wool and mohair production, marketing and processing.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The overall goals for this research to develop objective measures of wool, mohair, cashmere and other animal fibers

to increase profitability of the sheep and Angora goat industries remains the primary emphasis of the research. In fiscal year 1994 the program has expanded to include an objective to investigate pesticide levels in the lanolin in wool. Computer software programs for the automatic image analysis system are being evaluated and improved for the purpose of measuring the average diameter and distribution of animal fibers. Software is also being written to permit rapid, accurate measurement of other fiber properties. Near infra red reflectance analysis was compared to standard practices for yield measurement of mohair.

Continued progress is being made to improve the quantity and quality of fibers produced from sheep and goats. Correlation studies are being made to compare measurements made with image analyzer, a laser scan instrument, to those measured by microprojection. Numerous scientific and technical papers were published during the past year.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from appropriated funds in the amount of \$150,000 per year for fiscal years 1984-1985; \$142,000 per year for fiscal years 1986-1989; \$144,000 for fiscal year 1990; \$198,000 for fiscal year 1991; and \$250,000 per year for fiscal years 1992-1993; fiscal year 1994, \$235,000. A total of \$1,945,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$150,913 state appropriations, \$11,800 product sales, \$5,817 industry, and \$3,556 miscellaneous in 1991; \$111,394 state appropriations, \$25,451 product sales, \$41,442 industry, and \$3,068 miscellaneous in 1992; and \$152,699 state appropriations, \$39,443 product sales, \$40,804 industry and \$3,556 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research is in progress at the Texas Agricultural Experiment Station, the University of Wyoming and Montana State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that five years will be required to complete the current research.

GRANTS TO RESEARCH CONSORTIA

Mr. DURBIN. Please list each of the Special Research Grants funded in fiscal year 1994 that fund a research consortium.

Dr. JORDAN. Special Research Grants fund a number of organizational structures that include consortia, partnerships, centers, institutes, programs, projects, and alliances. Characteristically, these groupings involve more than one institution, some structure for management, and a coordination mechanism for the research to be undertaken. These aspects separate these types of Special Research Grants from individual projects that are intended to undertake specific research questions.

There is no clear distinction in the terminology used for research organizations funded through Special Research Grants. We have

therefore used the research project title to distinguish consortia from the other types of organization. The fiscal year 1994 consortia are: Animal Science Food Safety Consortium; Iowa Biotechnology Consortium; Midwest Biotechnology Consortium; Southwest Consortium for Plant Genetics and Water Resources; International Arid Lands Consortium; and Midwest Feeds Consortium.

Mr. DURBIN. Which of these award grants to their members on a competitive basis?

Dr. JORDAN. Every Special Research Grant applicant provides a proposal to the USDA that is subjected to merit review. For consortia, the proposal typically describes the intended goals of the research program and the management mechanism that will be used to achieve those goals. In some cases, consortia divide research responsibilities with appropriate funding non-competitively among memberships through consensual agreement. Other consortia solicit proposals from its membership, and these are often peer reviewed and competitively awarded. Two consortia in the FY 1994 funding are exclusively using competitively awarded grants for their memberships. These consortia are the Midwest Biotechnology Consortium and the Southwest Consortium for Plant Genetics and Water Resources.

Mr. DURBIN. When they award grants to their members are they peer reviewed and is the peer review done by consortium members only?

Dr. JORDAN. Both the Midwest Biotechnology Consortium and the Southwest Consortium for Plant Genetics and Water Resources use external peer reviews (i.e. non-members) to evaluate proposals prior to awarding grants on a competitive basis. This is the initial year for the Midwest Feed Consortium and the program is currently being reviewed by external peer reviewers. The International Arid Lands Consortium is peer reviewed by a committee of Consortium members. The Iowa Biotechnology Consortium's proposals are reviewed by Consortium members, and the Animal Science Food Safety Consortium uses a mix of members and non-members.

Mr. DURBIN. Is the consortium allowed to charge overhead on the grants they award to their members?

Dr. JORDAN. These grants are awarded under the authority of Section 2(c) of Public Law 89-106, as amended, which allows the Secretary of Agriculture to make Special Research Grants to facilitate or expand promising research breakthroughs in areas of the food and agricultural sciences and to facilitate or expand ongoing State-Federal food and agricultural research programs.

In fiscal year 1994, all of the consortium grants listed above will be awarded under Section 2(c)(1)(B). These grantees may not charge overhead per Section 1473 of Public Law 95-113, as amended, which states in part that funds made available by the Secretary under established Federal-State partnership arrangements to State cooperative institutions . . . under subsection (c)(2)—now 2(c)(1)(B)—. . . shall not be subject to reduction for indirect costs. This restriction will flow down to any subawards made under the prime grants.

When the Midwest Biotechnology Consortium grant was initiated in fiscal year 1989, it was competitively awarded to Purdue University for a five-year project. The authority used for this grant was Section 2(c)(1)(A) and therefore Purdue University was entitled to

charge overhead under the grant. However, this overhead was restricted to the percentage specified in the Appropriations Act each fiscal year. For example, Section 719 of the Fiscal Year 1994 Agriculture Appropriations Act limits such overhead to 14 percent of the total Federal Funds awarded. This restriction flowed down to any subawards made under the prime grant.

Because the language concerning the Midwest Biotechnology Consortium grant in the fiscal year 1994 Agriculture Appropriations Act states that the grant is to be "managed by Purdue University," the award will be made non-competitively under Section 2(c)(1)(B). Therefore, overhead charges will not be allowed for the prime grantee, Purdue University, nor for any subawards.

Mr. DURBIN. Is the awardee of the grant allowed to charge overhead?

Dr. JORDAN. In fiscal year 1994, all of the consortium grants listed above will be awarded under Section 2(c)(1)(B). These grantees may not charge overhead per Section 1473 of Public Law 95-113, as amended, which states in part that funds made available by the Secretary under established Federal-State partnership arrangements to State cooperative institutions . . . under subsection (c)(2)—now 2(c)(1)(B)—. . . shall not be subject to reduction for indirect costs. This restriction will flow down to any subawards made under the prime grants.

Mr. DURBIN. Is it law or regulation that provides that Special Research Grants are "mutually beneficial research and therefore no overhead charges are allowed?"

Dr. JORDAN. It is a statutory requirement that grants awarded under the authority of 2(c)(1)(B) may not charge overhead. This requirement is contained in Section 1473 of Public Law 95-113, as amended.

Mr. DURBIN. Are grants to consortia treated as competitive grants where overhead charges are allowed? Please explain why a consortium or its members can charge overhead.

Dr. JORDAN. Under the Special Research Grants Program, a grant to a consortium will allow overhead on the prime award as well as subawards in the prime grant is awarded on a competitive basis and the grant is issued under the authority of Section 2(c)(1)(A) of Public Law 89-106, as amended. If the prime grant is not made on a competitive basis, i.e., the grant is earmarked for a particular institution, and is therefore issued under the authority of Section 2(c)(1)(B), overhead is not allowed on either the prime award or subawards.

NATIONAL RESEARCH INITIATIVE

PLANT GENOME MAPPING

Mr. DURBIN. How much of the NRI funds for fiscal years 1993 and 1994 have been for plant genome mapping?

Dr. JORDAN. In fiscal year 1993 NRI funds totaling \$12,126,000 supported plant genome mapping research and the estimate for fiscal year 1994 is \$13.0 million.

ANIMAL GENOME MAPPING

Mr. DURBIN. How much of the NRI funds for fiscal years 1993 and 1994 have been for animal genome mapping?

Dr. JORDAN. In fiscal year 1993 NRI funds totaling \$4,096,000 supported animal genome mapping research and the estimate for fiscal year 1994 is \$3.8 million.

1890 INSTITUTIONS AND TUSKEGEE UNIVERSITY

Mr. DURBIN. At this point in the record, would you please update the table which appears on page 571 of Part 2 of last year's hearings which shows the total funds available to the 1890 Institutions and Tuskegee University?

[The information follows:]

INITIATIVE TO SUPPORT 1890 LAND-GRANT INSTITUTIONS AND TUSKEGEE UNIVERSITY—PROGRAM LEVEL

[In millions of dollars]

Program	1993 actual	1994 current estimate	1995 budget
Cooperative State Research Service:			
Evans-Allen formula for 1890 institutions	\$27.4	\$28.2	\$28.2
Capacity building grants	10.3	10.6	10.6
Other programs, grants to other historically black institutions	3.7	4.0	2.1
Subtotal, CSRS	41.4	42.8	40.9
Extension Service:			
Formula payments for extension service	24.7	25.5	25.5
Facilities grants	8.0	7.9	7.9
Other programs, grants to other historically black institutions	1.9	1.9	1.9
Subtotal, ES	34.6	35.3	35.3
Other Agencies:			
Cooperative research, support of agency programs, student assistance and recruiting	16.7	16.1	19.4
Total, Program Funds	92.7	94.2	95.6

CAPACITY BUILDING GRANTS

Mr. DURBIN. Please list for the record the capacity building grants that were awarded in fiscal year 1993 and those that have been awarded to date for fiscal year 1994.

Dr. JORDAN. We will provide a table for the record that shows the 1890 Capacity Building Grants awarded in fiscal year 1993. The Peer Review Panel for fiscal year 1994 met March 21 through 25 to review 179 proposals from the 17 eligible institutions. About one-third are for teaching projects and two-thirds for research. Results should be available from this competition in mid-summer 1994.

[The information follows:]

1890 INSTITUTION CAPACITY BUILDING GRANTS PROGRAM

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The objective of this program is to advance the teaching and research capabilities of the 1890 Land-Grant Institutions and Tuskegee University through cooperative initiatives with Federal and non-Federal entities. This program addresses the need to: (1) attract more minority students into the food and agricultural sciences, (2) expand the linkages among the 1890 Institutions and with other colleges and universities, and (3) strengthen the overall capacity of the 1890 Land-Grant Institutions to more firmly establish them as full partners in the food and agricultural science and education system. Teaching projects addressed the following targeted need areas: curricula design and materials development, faculty preparation and enhancement, instructional delivery systems, student experiential learning, scientific instrumentation for teaching, and student recruitment and retention. Research projects addressed high-priority initiatives where there is a present or anticipated need for increased capabilities, such as studies and experimentation in the food and agricultural sciences, the establishment of centralized research support systems, and the development of improved technology delivery systems for producers and consumers. Funds to support research and teaching projects were used as follows:

Research grants	\$4,893,421
Teaching grants	<u>4,971,250</u>
	\$9,864,671

This program is administered under the authority contained in Section 1472(c) of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3318). Eligible institutions include the sixteen 1890 Land-Grant Institutions and Tuskegee University.

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Research

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Alabama A&M University Normal, AL 35762	S. Saha K. Soliman G. Sharma	93-38814-8887	\$ 184,328	09/01/93 - 08/31/96
Title: Application of PCR to Identify DNA Sequences of Biological Importance				
Alabama A&M University Normal, AL 35762	J. Johnson	93-38814-8886	\$ 200,422	09/01/93 - 08/31/96
Title: Animal Biotechnology: Cryopreservation Methods on Embryo Development and Viability				
Alabama A&M University Normal, AL 35762	K. Soliman R. Taylor K. Sistani	93-38814-8888	\$ 217,558	09/01/93 - 08/31/96
Title: Molecular Basis of Tolerance to Aluminum Toxicity in Soybean (Glycine Max L.)				
Tuskegee University Tuskegee, AL 36088	P. Reddy E. Jenkins S. Wilson	93-38814-8673	\$ 186,702	09/01/93 - 08/31/96
Title: Bovine Cytokine Gene Expression and Cell Activation: Stress-induced Alterations				
Tuskegee University Tuskegee, AL 36088	J. Ferguson P. Reddy G. Malone	93-38814-8672	\$ 190,001	09/01/93 - 08/31/96
Title: Immunopathological Mechanisms of Caprine Arthritis-Encephalitis Virus				

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Research

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Tuskegee University Tuskegee, AL 36088 Title: Molecular Mapping Quantitative Trait Loci for Reproductive Traits in Turkeys	E. Smith	93-38814-8674	\$ 184,096	09/01/93- 08/31/96
Delaware State College Dover, DE 19901 Title: Development of Crawfish Culture Methods for Delaware	B. Petrosky	93-38814-8707	\$ 276,098	09/01/93- 08/31/96
Florida A&M University Tallahassee, FL 32307 Title: Bioconversion of Grape Residues into Livestock Feed	O. Lamikanra S. Leong M. Abazinge Y. Owusu	93-38814-8708	\$ 297,253	09/15/93- 09/30/96
Florida A&M University Tallahassee, FL 32307 Title: Enhancing Methionine Level and Aflatoxin Resistance in Peanut via Biotechnology	M. Sheikh	93-38814-8731	\$ 297,382	09/15/93- 09/30/96
Fort Valley State College Fort Valley, GA 31030-3298 Title: Developing Micropropagation and Management Technology for Papaya	U. Yadava	93-38814-8709	\$ 297,500	09/01/93- 08/31/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Research

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Kentucky State University Frankfort, KY 40601 Title: Calcium Metabolism and Bone Structure Impacted by Dieting and Body Weight Change	C. Lee C. Wang	93-38814-8732	\$ 288,769	09/01/93- 08/31/96
Kentucky State University Frankfort, KY 40601 Title: Nutritional Requirements and Production Trial of Hybrid Striped Bass in Kentucky	C. Webster	93-38814-8734	\$ 105,320	08/01/93- 02/28/96
Kentucky State University Frankfort, KY 40601 Title: Monitoring Exposure and Biomarkers in Limited Resource Farmers to Ag-Chemicals	M. Panemangalore M. Byers	93-38814-8733	\$ 294,551	09/01/93 08/31/96
University of Maryland - Eastern Shore Princess Anne, MD 21853 Title: Enhancing Growth Performance and Carcass Quality in Swine and Broilers	M. Estienne J. Harter-Dennis	93-38814-8710	\$ 254,040	09/01/93- 08/31/96
Alcorn State University Lorman, MS 39096 Title: Chinese Melon Production as an Alternative Crop for Small Farmers in the Southern United States	O. Vadhwa R. Idris	93-38814-8711	\$ 176,338	09/15/93- 09/30/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Research

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Alcorn State University Lorman, MS 39096	O. Vadhwa R. Idris L. Huam	93-38814-8712	\$ 152,954	09/15/93- 09/30/96
Title: Low Input Sustainable Production of Southern Blueberries on Erodible Loess Soils				
North Carolina A&T State University Greensboro, NC 27411	W. Amponsah D. McDowell R. Henning	93-38814-8689	\$ 287,280	08/01/93- 07/31/96
Title: Strengthening a Trade Research Program to Enhance Access to International Markets by Small and Minority Agribus.				
Langston University Langston, OK 73050	C. Kleinholz G. Luker	93-38814-8713	\$ 152,954	09/01/93- 08/31/95
Title: Phytoplankton Management Strategies for Channel Catfish Culture Ponds				
Langston University Langston, OK 73050	S. Hart T. Sahlu D. Mourey	93-38814-8714	\$ 119,087	09/01/93- 08/31/96
Title: Development of Perennial Cool Season Pasture Systems for the Southern Great Plains				
South Carolina State University Orangeburg, SC 29117	S. Barnal	93-38814-8715	\$ 296,301	09/01/93- 08/31/96
Title: Analysis of Agricultural Loan Defaults: Development of Credit/Loan Analysis Models				

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Research

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Prairie View A&M University Prairie View, TX 77446 Title: Decision Support System for Meat Goat Production	J. Drakuma E. Risch	93-38814-8716	\$ 281,454	09/01/93- 08/31/96
Virginia State University Petersburg, VA 23803 Title: Evaluation of Native "Bradyrhizobium Japonicum" in Virginia Soils	J. Upadhyay	93-38814-8717	\$ 152,953	09/01/93- 08/31/96
Total : \$ 4,893,421				

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Alabama A&M University Normal, AL 35762 Title: Infusion of Sustainable Concepts in Agricultural Curricula	C. Reddy	93-38820-8890	\$ 191,250	09/01/93- 08/31/96
Alabama A&M University Normal, AL 35762 Title: Strengthening the Agribusiness Programs at Alabama A&M University	H. Jones J. Befecadu G. Wheelock	93 38820-8889	\$ 191,113	09/01/93- 08/31/95
Tuskegee University Tuskegee, AL 36088 Title: Computer Assisted Veterinary Medical Education: An Alternative Pathway	T. Habtemariam	93-38820-8676	\$ 198,792	09/01/93 08/31/96
Tuskegee University Tuskegee, AL 36088 Title: A Program for Achievement by Students Enrolled in Agriculturally Related Studies	M. Maloney A. Ludwick F. Foster	93 38820-8675	\$ 225,000	09/01/93- 08/31/96
The Board of Trustees University of Arkansas at Pine Bluff Pine Bluff, AR 71601 Title: Enhancing Library Services in Support of the Degree Program in Regulatory Science	E. Fontenette J. McCray	93-38820-8677	\$ 190,800	09/01/93- 08/31/95

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
The Board of Trustees University of Arkansas at Pine Bluff Pine Bluff, AR 71601 Title: Developing a Master of Science Degree Program in Aquaculture	C. Engle	93-38820-8678	\$ 152,680	09/01/93 - 08/31/95
Delaware State College Dover, DE 19901 Title: A Biotechnology Teaching Laboratory to Enhance Courses in the Plant Sciences	C. Broderick	93-38820-8718	\$ 181,705	09/01/93 - 08/31/96
Delaware State College Dover, DE 19901 Title: Computer Assisted Instruction in the Agricultural and Natural Resource Sciences	M. Maciarello	93-38820-8719	\$ 101,866	09/01/93 - 08/31/96
Florida A&M University Tallahassee, FL 32307 Title: Strengthening of the Master's Degree Program in Agricultural Sciences at Florida A&M University	V. Lamikara	93-38820-8720	\$ 189,228	09/15/93 - 09/30/96
Florida A&M University Tallahassee, FL 32307 Title: Enhancement of Agricultural Programs via Satellite and Computer Technologies	Z. Olorunnipa T. Balducci	93-38820-8721	\$ 191,249	09/01/93 - 08/31/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Kentucky State University Frankfort, KY 40601 Title: Developing a Rural Studies and Development Program	A. Seals	93-38820-8735	\$ 189,919	08/01/93- 07/31/96
Southern University and A&M College Baton Rouge, LA 70813 Title: Strengthening Agribusiness Instruction and Student Experiential Learning	L. Davis	93-38820-8737	\$ 182,419	08/01/93- 07/31/96
Southern University and A&M College Baton Rouge, LA 70813 Title: Pre-College Experience Program for High School Students: BAYOU PHASE VII	W. Rawls	93-38820-8736	\$ 191,181	08/01/93 07/31/96
University of Maryland - Eastern Shore Princess Anne, MD 21853 Title: Recruiting and Developing Academically Talented Minorities for Agricultural Careers	C. Brooks	93-38820-8722	\$ 222,705	09/01/93- 08/31/96
University of Maryland - Eastern Shore Princess Anne, MD 21853 Title: Enhancing Performance of Minority/Special Admit Students in Food and AG Sciences	S. Acquah	93-38820-8723	\$ 200,819	09/01/93- 08/31/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Lincoln University of Missouri Jefferson City, MO 65101	L. Marsh S. Meredith F. Edoho Title: Internationalizing the Undergraduate Experience for Agriculture Students	93-38820-8738	\$ 136,651	09/01/93- 08/31/96
Alcorn State University Lorman, MS 39096 Title: Enhancing Quantitative Skills of Agricultural Majors	L. Huam R. Kumar	93-38820-8724	\$ 225,000	09/15/93- 09/30/96
North Carolina A&T State University Greensboro, NC 27411 Title: Instructional Delivery: The Development of a Multimedia Technology Laboratory	L. Powers A. Bell	93-38820-8680	\$ 152,148	09/01/93 08/31/95
North Carolina A&T State University Greensboro, NC 27411 Title: Increasing Teaching Capacity of Laboratory Courses in Plant, Soil and Environmental Sciences	G. Reddy C. Raczkowski M. Kamp-Glass	93-38820-8682	\$ 186,775	09/01/93- 08/31/96
North Carolina A&T State University Greensboro, NC 27411 Title: Upgrading Curriculums of Agricultural Engineering and Landscape Architecture to Include Geographic Information System	G. Gayle	93-38820-8681	\$ 191,225	08/01/93- 07/31/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
North Carolina A&T State University Greensboro, NC 27411 Title: Strengthening Enrollment Using Shared Resources and Distance Delivery	A. Bell L. Powers	93-38820-8679	\$ 191,250	09/01/93- 08/31/95
Langston University Langston, OK 73050 Title: Minorities Graduate School Headstart Program	B. McCoy G. Acquash A. Lewis	93-38820-8683	\$ 146,445	08/01/93- 07/31/96
Langston University Langston, OK 73050 Title: Development of Electronic Learning Centers in the 1890 Land Grant Libraries	A. Mayberry	93-38820-8685	\$ 224,743	08/01/93- 12/31/94
Langston University Langston, OK 73050 Title: Computer Aided Instruction for Food and Agricultural Science Courses	R. Kimbard G. Acquash J. Ro	93-38820-8684	\$ 191,053	08/01/93- 07/31/96
Tennessee State University Nashville, TN 37209-1516 Title: A Qualitative and Quantitative Enhancement of Undergraduate Education in Agribusiness	S. Singh	93-38820-8726	\$ 147,946	09/15/93- 09/30/96

1890 Capacity Building Grants Program
1890 Capacity Building Grants - Teaching

ORGANIZATION	PRINCIPAL INVESTIGATORS	GRANT NUMBER	AMOUNT	AGREEMENT PERIOD
Tennessee State University Nashville, TN 37209-1516 Title: Building Human Capital in Foods and Nutrition	G. Johnson S. Godwin	93-38820-8725	\$ 191,206	09/15/93- 09/30/96
Prairie View A&M University Prairie View, TX 77466 Title: Strategies to Attract Minority Students into the Food and Agricultural Sciences	C. Strickland T. Daniels J. Meikle	93-38820-8727	\$ 186,082	09/01/93- 08/31/95

Total : \$ 4,971,250

MATCHING REQUIREMENTS

Mr. DURBIN. Have any schools experienced problems during the past 12 months with the matching requirement? How did fiscal year 1992 compare with the fiscal year 1993.

Dr. JORDAN. The 1890 Capacity Grants Program strongly encourages matching support. During the four-year history of the program, the schools have been successful in securing matching funds. For fiscal year 1993, the schools provided matching support amounting to 68 percent of the \$9.9 million they received in awards under the program. As the program has grown in size, some schools have expressed their increased difficulty in securing matching funds.

MORRILL-NELSON GRANTS

Mr. DURBIN. Please list for the record the distribution of Morrill-Nelson funds compared to the same amount under Hatch Act. This is similar to the chart that appears on page 581 of Part 2 of last year's hearing.

[The information follows:]

Comparison of Fiscal Year 1994 Distribution of Morrill-Nelson Funds
Versus Hatch Act Formula
(In Dollars)

State	Distribution of Morrill- Nelson Funds	Distribution Using Hatch Act Formula
Alabama	\$50.000	\$57.293
Alaska.....	50.000	15.279
American Samoa.....	50.000	10.862
Arizona	50.000	32.340
Arkansas	50.000	49.997
California	50.000	95.932
Colorado	50.000	44.526
Connecticut	50.000	29.302
Delaware	50.000	21.005
District of Columbia	50.000	12.211
Florida	50.000	55.855
Georgia.....	50.000	72.197
Guam	50.000	13.711
Hawaii	50.000	20.553
Idaho	50.000	35.896
Illinois.....	50.000	90.978
Indiana	50.000	86.271
Iowa.....	50.000	93.999
Kansas	50.000	55.728
Kentucky	50.000	81.214
Louisiana	50.000	47.692
Maine	50.000	30.766
Maryland	50.000	40.133
Massachusetts.....	50.000	36.022
Michigan	50.000	83.669
Micronesia	50.000	11.823
Minnesota	50.000	83.527
Mississippi	50.000	54.085
Missouri	50.000	79.583
Montana	50.000	36.954
Nebraska	50.000	57.376
Nevada	50.000	20.124
New Hampshire.....	50.000	25.130
New Jersey.....	50.000	38.443
New Mexico	50.000	25.998
New York	50.000	87.531
North Carolina.....	50.000	95.554
North Dakota	50.000	37.401
Northern Marianas	50.000	10.542
Ohio	50.000	100.872
Oklahoma	50.000	50.073

State	Distribution of Morrill- Nelson Funds	Distribution Using Hatch Act Formula
on	50.000	52.485
Pennsylvania	50.000	100.967
Puerto Rico	50.000	40.584
Rhode Island	50.000	19.808
South Carolina.....	50.000	52.020
South Dakota	50.000	41.113
Tennessee	50.000	71.261
Texas	50.000	111.040
Utah	50.000	29.094
Vermont	50.000	23.465
Virgin Islands.....	50.000	13.233
Virginia	50.000	63.689
Washington	50.000	53.185
West Virginia.....	50.000	39.176
Wisconsin	50.000	84.528
Wyoming	50.000	25.905
Other (Federal Admin.).....	0	0
Total	2,850.000	2,850.000
	=====	=====

MORRILL-NELSON GRANTS

Mr. DURBIN. How are these funds used by the states?

Dr. JORDAN. Morrill-Nelson funds are distributed by the 50 states, the District of Columbia, and six U.S. Territories to land-grant colleges of agriculture, which in turn, use them for faculty salaries, curricula development, and other operating costs associated with instructional programs. All food and agricultural sciences resident instruction programs at land-grant institutions are eligible for this support. In fiscal year 1992, the last year for which data are available, approximately \$2.6 million were used for salaries and wages by the institutions. All of the 16 1890 land-grant institutions received Morrill-Nelson funds in 1992; Tuskegee University did not. Of the \$800,000 available to the 16 states that have 1890 institutions, \$218,839.30 or 27 percent were distributed to 1890 institutions in 1992. Florida and South Carolina direct 50 percent of their Morrill-Nelson funds to the 1890 institutions in their respective states.

Mr. DURBIN. What year was Morrill-Nelson enacted and what is the U.S. Code citation?

Dr. JORDAN. The Nelson Amendment to the Morrill Acts of 1862 and 1890 was passed March 4, 1907, providing \$50,000 per state for land-grant institutions. It is cited in 7 U.S.C. 322, 34 Stat. 1281 and 1282.

ANIMAL HEALTH AND DISEASE RESEARCH

Mr. DURBIN. Please describe how the \$5,551,000 appropriated for fiscal years 1992, 1993, and 1994 is being used for the animal health and disease program.

Dr. JORDAN. Animal health and disease research funds were allocated by CSRS on a formula basis to accredited schools and colleges of veterinary medicine and State Agricultural Experiment Stations to conduct research that responds to a number of issues related to the general welfare, health and productivity of domestic livestock, poultry, aquatic animals and other income-producing animals. Funds are also directed to research that reduces microbial populations in food animals and, thus, to help to alleviate food safety problems. Institutions in the fifty States have participated in the animal health and disease research program. All projects approved for support under this title are subject to rigorous peer review standards developed by the eligible institutions. A CSRS scientist also reviews each project to determine whether the proposed priority research addresses research issues developed by CSRS in consultation with constituent groups, including commodity groups. Both basic and applied research is funded on infectious and non-infectious disease agents which impair the health and function of animals. Under the animal health and disease research program, eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of \$100,000 under this authorization.

The original goal was to encourage interdisciplinary research among scientists to address a number of problems impacting the swine industry. The grant has provided support to projects that have produced research results that improve environmental man-

agement practices in confined units, strategies that use medicated early weaning practices in the rearing of pigs, and improved nutrient management practices for the swine herd.

ANIMAL HEALTH AND DISEASE RESEARCH

Mr. DURBIN. Please provide for the record a comparison of how the \$5,551,000 will be distributed in fiscal year 1994 and how the same amount would be distributed under the Hatch Act formula. [The information follows:]

Comparison of Fiscal Year 1994 Distribution of \$5,551,000
Based on Animal Health and Disease Formula versus Hatch Act Formula
(In Dollars)

State/Recipient -----	Distribution Based on Animal Health and Disease Formula -----	Estimated Distribution Based on Hatch Act Formula -----
ALABAMA		
Agricultural Experiment Station, Auburn University	48,281	106,449
School of Veterinary Medicine, Auburn University	65,358	0
School of Veterinary Medicine, Tuskegee University	1,415	0
ALASKA		
Agricultural Experiment Station, University of Alaska	7,309	28,722
ARIZONA		
Agricultural Experiment Station, University of Arizona	50,090	58,867
AMERICAN SAMOA		
Agricultural Exper. Station, American Samoa Community College	0	20,759
ARKANSAS		
Agricultural Experiment Station, University of Arkansas	85,725	92,880
CALIFORNIA		
Agricultural Experiment Station, Univ. of California, Oakland .	187,147	177,662
School of Veterinary Medicine, University of California, Davis.	291,796	0
COLORADO		
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University	281,169	81,537
CONNECTICUT		
Agricultural Experiment Station, Univ. of Connecticut, Storrs .	17,523	54,142
DELAWARE		
Agricultural Experiment Station, University of Delaware	19,919	38,747
DISTRICT OF COLUMBIA		
Agricultural Experiment Station, Univ. of District of Columbia	0	22,985
FLORIDA		
Agricultural Experiment Station, University of Florida	92,130	104,413
College of Veterinary Medicine, University of Florida	47,163	0
GEORGIA		
Agricultural Experiment Station, University of Georgia	16,285	134,691
College of Veterinary Medicine, University of Georgia	122,222	0
GUAM		
Agricultural Experiment Station, University of Guam	0	25,799
HAWAII		
Agricultural Experiment Station, University of Hawaii	7,560	37,823
IDAH0		
Agricultural Experiment Station, University of Idaho	49,950	66,372
ILLINOIS		
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois	161,287	170,349
INDIANA		
Agricultural Experiment Station and College of Veterinary Medicine, Purdue University	87,092	161,988
IOWA		
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	42,232	175,850
College of Veterinary Medicine, Iowa State University	204,213	0
KANSAS		
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University	197,776	103,651

State/Recipient	Distribution Based on Animal Health and Disease Formula	Estimated Distribution Based on Hatch Act Formula
KENTUCKY		
Agricultural Experiment Station, University of Kentucky	82,032	152,362
LOUISIANA		
Agricultural Experiment Station, Louisiana State University ...	62,419	88,628
College of Veterinary Medicine, Louisiana State University	41,680	0
MAINE		
Agricultural Experiment Station, University of Maine	20,492	56,863
MARYLAND		
Agricultural Experiment Station, University of Maryland	39,077	74,278
MASSACHUSETTS		
Agricultural Experiment Station, University of Massachusetts ..	10,719	66,452
School of Veterinary Medicine, Tufts University	17,412	0
MICHIGAN		
Agricultural Experiment Station and College of Veterinary Medicine, Michigan State University	73,946	156,803
MICRONESIA		
Agricultural Experiment Station, College of Micronesia	0	22,696
MINNESOTA		
Agricultural Experiment Station, University of Minnesota	77,637	156,543
College of Veterinary Medicine, University of Minnesota	93,104	0
MISSISSIPPI		
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University	70,902	100,251
MISSOURI		
Agricultural Experiment Station, University of Missouri	64,849	149,376
College of Veterinary Medicine, University of Missouri	101,801	0
MONTANA		
Agricultural Experiment Station, Montana State University	71,849	68,100
NEBRASKA		
Agricultural Experiment Station, University of Nebraska	206,721	106,291
NEVADA		
Agricultural Experiment Station, University of Nevada	20,851	37,076
NEW HAMPSHIRE		
Agricultural Experiment Station, University of New Hampshire ..	8,555	46,661
NEW JERSEY		
Agricultural Experiment Station, Rutgers University	17,154	70,605
NEW MEXICO		
Agricultural Experiment Station, New Mexico State University ..	39,193	48,197
NEW YORK		
Agricultural Experiment Station, Cornell University	41,542	162,136
College of Veterinary Medicine, Cornell University	180,472	0
NORTH CAROLINA		
Agricultural Experiment Station, North Carolina State University	83,028	178,363
College of Veterinary Medicine, North Carolina State University	15,668	
NORTH DAKOTA		
Agricultural Experiment Station, North Dakota State University	51,395	69,241
NORTHERN MARIANA ISLANDS		
Agricultural Experiment Station, Northern Marianas College	0	20,236
OHIO		
Ohio Agricultural Research and Dev. Center, Ohio State Univ. ..	65,553	189,520
College of Veterinary Medicine, Ohio State University	35,988	0
OKLAHOMA		
Agricultural Experiment Station and College of Veterinary Medicine, Oklahoma State University	153,925	93,581

State/Recipient -----	Distribution Based on Animal Health and Disease Formula -----	Estimated Distribution Based on Hatch Act Formula -----
OREGON		
Agricultural Experiment Station, Oregon State University	78,043	96,732
College of Veterinary Medicine, Oregon State University	13,459	0
PENNSYLVANIA		
Agricultural Experiment Station, Pennsylvania State Univ.	53,020	188,627
College of Veterinary Medicine, University of Pennsylvania	86,665	0
PUERTO RICO		
Agricultural Experiment Station, University of Puerto Rico	11,744	74,760
RHODE ISLAND		
Agricultural Experiment Station, University of Rhode Island ...	4,957	36,389
SOUTH CAROLINA		
Agricultural Experiment Station, Clemson University	25,001	96,942
SOUTH DAKOTA		
Agricultural Experiment Station, South Dakota State University	97,407	76,343
TENNESSEE		
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee	65,472	133,178
TEXAS		
Agricultural Experiment Station and College of Veterinary Medicine, Texas A&M University	420,172	208,009
UTAH		
Agricultural Experiment Station, Utah State University	57,997	52,920
VERMONT		
Agricultural Experiment Station, University of Vermont	13,784	43,661
VIRGINIA		
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ.	86,577	118,951
VIRGIN ISLANDS		
Agricultural Experiment Station, College of Virgin Islands	0	24,896
WASHINGTON		
Agricultural Experiment Station, Washington State Univ.	27,303	98,350
College of Veterinary Medicine, Washington State Univ.	130,846	0
WEST VIRGINIA		
Agricultural & Forestry Experiment Station, West Virginia State University	12,114	72,903
WISCONSIN		
Agricultural Experiment Station and College of Veterinary Medicine, University of Wisconsin	174,750	158,648
WYOMING		
Agricultural Experiment Station, University of Wyoming	40,309	47,465
Subtotal	5,231,226	5,306,719
Federal administration	222,040	166,530
Small Business Act	79,934	59,951
Biotechnology Risk Assessment	17,800	17,800
Total	5,551,000	5,551,000

COMMERCIALIZING ALTERNATIVE CROPS

Mr. DURBIN. For fiscal years 1993 and 1994, please describe how the funds for commercializing alternative crops at the Polymer Institute are being used.

Dr. JORDAN. This research focuses on utilizing alternative agricultural materials as feedstocks for new and/or potentially valuable industrial products or product substitutes for the polymer industry that have traditionally been derived from petroleum-based raw materials. The polymer industry is the largest chemical products industry in the world and thus there is much demand for polymer related products such as foams, adhesives, coatings, elastomers, and high performance thin films. The University of Southern Mississippi is one of the top two polymer science programs in America and offers a unique opportunity for U.S. agriculture with expertise, interest in agriculture, facilities, significant industrial ties and a professional commitment to commercializing agricultural materials. Development work at the University of Southern Mississippi emphasizes the execution of quality science that can potentially lead to industrial products.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The Commercializing Alternative Crops program has had \$400,000 appropriated in fiscal years 1992 and 1993, totaling \$1,300,000 per year, and \$500,000 in fiscal year 1994.

Mr. DURBIN. Does this project receive any other Federal funds? If so, please explain the source and amounts.

Dr. JORDAN. The Polymer Institute at the University of Southern Mississippi has received funds from the Department of Agriculture for development of coproducts from guayule, a perennial, natural rubber producing shrub native to the Southwest. In each of fiscal year 1992 and 1993, \$85,000, and in fiscal year 1994, \$92,550 were allocated to the Polymer Institute through actions of the Guayule Administrative Management Committee—GAMC. The GAMC apportioned funds appropriated under the Supplemental and Alternative Crops authority to two major component programs: breeding/genetics and coproducts development.

Mr. DURBIN. What has been accomplished to date with this funding?

Dr. JORDAN. The original goal of the research was to plan and establish an organizational structure and/or protocol for commercializing agricultural materials. Aggressive laboratory based research and commercializing efforts on guayule, lesquerella, kenaf, crambe, rapeseed, and most recently, vernonia oil have been undertaken. Some accomplishments include: extensive scientific information has been gained via laboratory research, development and commercializing efforts and this information has been distributed via project reports, scientific research articles, chapters in books, business magazines (Management Review), technical presentations, and presentations to industry; several new products have been produced including pressure sensitive adhesives, foams of all types (auto dashboards, construction insulating foams, cushion foams), a water borne waterproofer with low VOC's for sealing wood and concrete, peelable coatings for temporary protection, coatings with

antibarnacle activity, new crosslinkers for no VOC powder coatings, 100 percent (no VOC) solids coatings that cure in seconds to hard, durable finishes with ultraviolet light, high performance nylons, and new wood preservatives that do not contain heavy metals such as copper, chromium and arsenic; industrial interest and support for the majority of these efforts has been secured. For instance, the U.S. Paint Company in St. Louis, Missouri, is contributing \$140,000 per year to the development of antibarnacle compositions based on guayule coproducts. Thus, U.S. Paint can immediately market and commercialize this technology when they are convinced it is proven and when a supply of agricultural raw material is available. Keeping with the Administration's policy of awarding research grants competitively, no further Federal funding for this grant is requested.

Mr. DURBIN. When does the Polymer Institute anticipate that the need for Federal funding will be completed?

Dr. JORDAN. The university staff feel public funds are needed on a continuing basis.

AQUACULTURE CENTERS

Mr. DURBIN. Each year for the past several years, \$4,000,000 has been appropriated for the aquaculture centers. Please describe for the Committee how the funds were used at each of these centers in fiscal years 1992, 1993, and 1994.

Dr. JORDAN. In fiscal years 1992, 1993, and 1994 grants were made for the operation of five Regional Aquaculture Centers. The centers are administered through Mississippi State University, the University of Washington, the University of Massachusetts, Dartmouth—formerly Southeastern Massachusetts University, the University of Hawaii and the Oceanic Institute, in a joint effort. Each Center's program is uniquely targeted to industry needs and species of the regions. Projects have built-in technology transfer components; are team coordinated with personnel from research, extension, government, and industry; and are designed to directly impact commercial aquaculture development. Selected examples of an accomplishment in each region are: reduction of protein content of catfish feeds without affecting fish production or frozen storage quality, enabling a lowering of feed costs by \$10 a ton—Southern Region; development and commercial licensing of a successful vaccine against IHN virus, a major disease in coldwater aquaculture—Western Region; development of a reduced-risk field planting schedule for seed oysters, based on improved understanding of conditions causing unexplained mortalities of hatchery-reared juveniles—Northeastern region; development and/or expansion of two leading yellow perch commercial culture operations, and start-up of at least 11 additional private yellow perch ventures as a direct consequence of Center research breakthroughs—North Central Region; FDS approval of the use of formalin in shrimp hatcheries, based on findings of Center-sponsored research—Tropical and Subtropical Region.

Mr. DURBIN. How do these Centers coordinate their research with ARS, other programs around the country and with private industry?

Dr. JORDAN. All five Regional Aquaculture Centers are operational with administrative structures consisting of a Board of Directors, Industry Advisory Council and Technical Committee. Coordination at the national level is carried out through a National Coordinating Council.

The Regional Aquaculture Centers are presently sponsoring more than 50 regional projects in support of the U.S. aquaculture industry. The projects involve established and evolving aquaculture firms, and public and private research and educational facilities in virtually every state. Projects address priorities identified by the U.S. aquaculture industry in close cooperation with the Centers' Industry Advisory Councils. Projects include industry partners working in association with the nation's leading aquaculture scientists and extension education specialists. The regional networking fostered by the Centers allows a comprehensive, focused, team oriented approach to addressing the aquaculture industry's most critical needs. In addition, the Director of USDA's Office of Aquaculture, which administers the Regional Aquaculture Centers program, chairs, on behalf of the Secretary of Agriculture, the Joint Subcommittee on Aquaculture—JSA—a statutory FCCSET committee. JSA is charged with coordinating and implementing the government's National Aquaculture Development Plan.

Mr. DURBIN. Please provide a table for the record showing the amount of funding received by each center for fiscal years 1993, 1994, and 1995.

[The information follows:]

AQUACULTURE CENTERS

Institution	Fiscal year—		
	1993	1994	1995 estimate
The Oceanic Institute Waimanalo, Hawaii	\$764,208	764,360	760,480
University of Massachusetts North Dartmouth, Massachusetts,	764,208	764,360	760,480
Michigan State University East Lansing, Michigan	764,208	764,360	760,480
Mississippi Agriculture and Forestry Experiment Station Mississippi State, Mississippi	764,208	764,360	760,480
University of Washington Seattle, Washington	764,968	764,360	760,480
Subtotal, Grants	3,821,800	3,821,800	3,802,400
SBIR	58,200	58,200	77,600
Federal Administration	120,000	120,000	120,000
Total Appropriation	4,000,000	4,000,000	4,000,000

RANGELAND RESEARCH

Mr. DURBIN. For fiscal years 1992, 1993, and 1994, \$475,000 was appropriated for grants for rangeland research, which are awarded on a competitive basis. What is the major thrust of this research and what has been accomplished?

Dr. JORDAN. The major thrust of this research is to improve the rangeland resources and provide a scientific base for decisions to be made by those directly involved in the range and its resources.

Accomplishments include determining that Lehman Lovegrass, an exotic, remained viable and would germinate after periods of low soil moisture during which native grasses became unviable. In a long-term study, it was shown that nutrients and organic matter

added over 35 years markedly influenced soil and vegetal development of a site severely degraded by grazing in the late 1800's. This study provided new evidence on secondary succession for the summer range. Vegetation data indicate that after four years of no grazing, plant vigor declined. Also, average daily gains of cattle grazing low condition versus high condition range differed in that early season gains were greater on low condition ranges while cattle on high condition ranges were greater in late season grazing. While mother and post ingestive feedback are important in the development dietary habits of ruminants, ingestive feedback is more important than mother. As animals are used to control vegetation, feedback is more effective; therefore, such trained animals can be used effectively at least through one generation. Also, early feedback can protect animals from ingesting poisonous plants. Rangeland is a complex ecosystem. Many studies are long-range, some of them requiring decades. Other studies examine the interaction of plants, animals, climate, and humans on the resource. Interdisciplinary research is becoming more the norm than single investigator studies.

Mr. DURBIN. Which institutions received these grants and in what amounts for fiscal years 1992, 1993, and 1994?

[The information follows:]

RANGELAND RESEARCH

Institution	Fiscal year—		
	1992	1993	1994
USDA, ARS Pacific West Area, Albany, California		\$72,572	
USDA, ARS Northern Plains Area, Ft. Collins, Colorado	\$77,000		
Colorado State University, Ft. Collins, Colorado	69,391	77,200	
Montana State University, Bozeman, Montana	78,500		
Nebraska Agricultural Experiment Station, Lincoln, Nebraska		74,740	
Oregon Graduate Institute of Science and Technology, Beaverton, Oregon	78,500		
Agricultural Experiment Station, Texas A&M University System	151,000	73,982	
Utah State University, Logan, Utah		77,200	
Intermountain Research Station Forest Service, USDA, Ogden, Utah		77,175	
Subtotal, Grants	454,391	452,869	1,453,839
SBIR	5,759	6,911	6,911
Biotechnology Risk Assessment	600	970	0
Federal Administration	14,250	14,250	14,250
Total Appropriation	475,000	475,000	475,000

¹ Fiscal Year 1994 awards have not been made.

ALTERNATIVE CROPS

GUAYULE

Mr. DURBIN. Would you please describe for the Committee the work being carried out under the alternative crops program for fiscal years 1993 and 1994?

Dr. JORDAN. The goal of guayule research is to make guayule rubber production cost competitive with imported natural rubber. Commercialization research has focused on two critical areas: first, plant breeding and genetics to increase rubber yield and quality and second, co-product development. Research on breeding and genetics has resulted in significantly increased rubber yields per acre,

and agronomic practices have been optimized. Guayule produces a resin that has been shown to be effective against termites, fungi and marine fouling organisms. When added to paint and coating formulations, the result is an improved, environmentally friendly product with the appropriate biocidal or repellent properties. Guayule also produces low grade rubber that can be added to paints and coatings to enhance flexibility and modify peeling characteristics. Rubber extracted in the form of latex, as opposed to solid rubber, can be used for the manufacture of medical rubber products such as surgical gloves. As allergic reactions to natural rubber products become more widespread, guayule latex offers a superior alternative.

Mr. DURBIN. Please list for the record the locations where this work is carried out, including the funding levels for fiscal years 1993 and 1994.

[The information follows:]

GUAYULE RESEARCH

Institution	Fiscal year—	
	1993	1994
Arizona State University	\$19,000	\$19,000
University of Arizona	168,650	161,100
University of California, Riverside	150,100	150,100
University of Southern Mississippi	85,000	92,550
New Mexico State University	38,000	38,000
Texas A&M University	144,300	144,300
University of Akron	23,000	25,000
USDA Forest Service	9,151	7,891
Total	637,201	637,941

Mr. DURBIN. What is the status of the Department of Defense support for guayule?

Dr. JORDAN. The U.S. Army is currently testing light truck tires manufactured from guayule rubber produced under a joint USDA/DoD program. Laboratory testing at the U.S. Army Tank Automotive Command, Warren, Michigan has been completed and has shown these tires to be of superior quality. The field test for durability is being conducted at the U.S. Army Proving Grounds in Yuma, Arizona. Naval aircraft tires are being manufactured by Goodyear. The contracts are administered by Naval Air Systems Command and the tires will be field tested at Patuxent Naval Air Warfare Center, Patuxent River, Maryland.

A cooperative effort between CSRS, Forest Service and U.S. Naval Facilities Command is ongoing to develop alternative treatments against termites for utility poles at a field site in Hawaii. Guayule resin is included in the treatment regime.

CRAMBE/RAPESEED

Mr. DURBIN. Would you please describe for the Committee the work being carried out on crambe and rapeseed under the alternative crops program for fiscal years 1993 and 1994?

Dr. JORDAN. The High Erucic Acid Development Effort, working in cooperation with private industry, has had many successes. Some of the more important for United States agriculture and in-

dustry include increasing crambe acreage to 60,000 acres in 1993 from zero only four years ago. A new process has been developed to convert erucic acid to its derivatives, which may reduce the cost of resulting products and coproducts by 40 to 50 percent from original levels. This will make erucic acid much more competitive with petroleum products. Glucosinolates, or compounds contained in crambe in industrial rapeseed meals, have proven effective as a natural biocides against nematodes, housefly larvae, corn rootworm, and other insects and pests.

Several patents have been issued to International Lubricants, Incorporated of Seattle, Washington for the use of erucic acid in lubricants, transmission fluid additives, and other fluids. The automatic transmission fluid additive developed by International Lubricants, Incorporated is now used by five automotive Original Equipment Manufacturers in Europe, including BMW, Citroen, Saab, Peugeot, and Volvo. International Lubricants, Incorporated has also patented a product made from high erucic acid oils called telomer. This product is a biodegradable and non-toxic vegetable oil thickener that can be used in many industrial and consumer products including cosmetics, gear box lubricants, paints and coatings, and inks. International Lubricants, Incorporated holds both the process and product patents to this product in the United States.

Nylon 1313 has been evaluated for use in automotive, electrical and other high volume uses. A project is underway to make test quantities of nylon 1313 for use by private industry. It should be particularly good for products where dimensional stability and moisture resistance are important. Finally, feeding trials have documented the high quality of crambe and rapeseed meals in livestock diets. Feeding trials have included tests on beef and dairy cattle, plus a project during fiscal year 1994 will include poultry.

Mr. DURBIN. Please list the locations where this work is carried out including the funding levels for fiscal years 1993 and 1994.

Dr. JORDAN. The High Erucic Acid Development Effort research for fiscal year 1994 is being carried out at 8 of the 9 member institutions, plus International Lubricants, Inc., the University of Southern Mississippi, and Eastern Michigan University. Consortium members include the land grant universities from the states of Georgia, Illinois, Idaho, Iowa, Kansas, Missouri, Nebraska, New Mexico and North Dakota, plus the Cooperative State Research Service and the Agricultural Research Service from USDA, and the Kansas Board of Agriculture. The funding in fiscal year 1993 was \$500,000, and in fiscal year 1994 is \$500,000.

CANOLA

Mr. DURBIN. Would you please describe for the Committee the work being carried out on canola under the alternative crops program for fiscal year 1994?

Dr. JORDAN. The objective of this work is to develop crop production methods for and improved varieties of canola for all locations in which it has the potential for profitable growth. The potential circumstances for growth of canola are varied as a spring crop, a winter planted crop, or as a second fall planted crop in locations with extended growing seasons.

Mr. DURBIN. How does the research on canola differ from the research on crambe and rapeseed?

Dr. JORDAN. The research on crambe and rapeseed differs from canola in that oil from crambe and rapeseed is inedible, containing large amounts of erucic acid. It is intended for industrial uses as lubricants, additives for plastics, or for conversion to nylon 1313. At present canola enjoys expanding markets as a food product, but when that market is saturated industrial uses may need to be developed for low erucic acid canola oil. Crambe is an entirely different species of plant than rapeseed/canola, and so requires different production practices. Canola and industrial rapeseed have been developed from the same plant, rapeseed, but were bred for different purposes—low erucic acid oils for food, canola, and high erucic acid oils for industrial products, crambe and industrial rapeseed.

Mr. DURBIN. Please list the locations where this work is carried out, including the funding location.

Dr. JORDAN. Canola research is directed from six regional centers across the country. Requests for proposals have been issued, and are being received for evaluation. It is expected that this research will be conducted on over half of the 50 states.

HESPERALOE

Mr. DURBIN. Would you please describe for the Committee the work being carried out on hesperaloe under the alternative crops program in fiscal year 1994?

Dr. JORDAN. Hesperaloe is a fiber crop that offers an alternative source of hard fibers currently processed from abaca, sisal, and other tropical crops. As a nonconventional crop for the southwestern U.S., hesperaloe would allow farmers to diversify and grow a crop that does not require the irrigation typically required for the region. Research conducted thus far has characterized hesperaloe's fiber qualities, potential biomass, and fiber production, for use in specialty paper applications. Research conducted at the University of Arizona for 1994 will address basic research problems related to stand establishment, irrigation practices, machinery design, and crop improvement. The results of this study will be applied to a commercialization program conducted in collaboration with private sector partners from the pulp and paper industry.

Mr. DURBIN. Please list the locations where this work is carried out.

Dr. JORDAN. This research will be accomplished at the Bioresources Research Facility of the University of Arizona, at Tucson, Arizona.

SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION PROGRAM

Mr. DURBIN. How were the funds for the Sustainable Agriculture Research and Education Program used, by location, for fiscal years 1992, 1993, and 1994?

Dr. JORDAN. The Sustainable Agriculture Research and Education—SARE—funds were used to support research and education projects authorized by the four SARE Regional Administrative Councils—Table 1 which will be provided for the record. SARE funds were also used for support of national initiatives in the areas

of sustainable agriculture mandated by the 1990 Farm Bill and approved by the SARE National Operations Committee. In addition, \$1,000,000 of the SARE resources were combined with \$1,000,000 from USEPA in 1991 and 1992, \$900,000 in 1993 and \$650,000 in 1994 for the Agriculture in Concert with the Environment—ACE—Program. In 1993 and 1994, 666 and 555 SARE proposals were submitted for funding, respectively—Table 2—which will also be provided for the record. Current SARE and ACE resources permitted the Administrative Councils to fund only 82 projects in 1993. Deliberations for 1994 are currently in progress. Details about SARE and ACE specific project locations, participants and results were provided to Congress in the 1993 Annual Report, as mandated in the 1990 Farm Bill. The 1994 Annual Report will be submitted to Congress about April 1.

[The information follows:]

TABLE 1. SARE/ACE FISCAL YEAR 1988–1993 FINANCIAL SUMMARY

[In thousands of dollars]

Budget category	Fiscal year—						Total
	1988	1989	1990	1991	1992	1993	
SARE Projects	3,142	3,647	3,560	4,242	4,103	4,032	22,726
ACE Projects				1,960	1,920	1,410	5,290
Regional Administration	262	253	240	398	312	700	2,165
Outreach Initiatives					613		613
National Initiatives	332	362	409	842	494	1,147	3,586
USDA Overhead	164	188	241	283	283	336	1,495
Total	3,900	4,450	4,450	7,725	7,725	7,625	35,875

TABLE 2.—FISCAL YEAR 1991–94 SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION PROGRAM PROPOSALS RECEIVED AND PROJECTS FUNDED BY REGION

Region	N. East	Southern	N. Central	Western	Total
PROPOSALS RECEIVED					
Fiscal year:					
1991	55	155	293	57	460
1992	52	227	2 255	27	561
1993	2 196	208	2 227	35	666
1994	2 136	2 228	3 138	53	555
PROJECTS FUNDED					
Fiscal year:					
1991	29	23	14	15	81
1992	12	10	2 46	9	77
1993	14	12	2 44	12	82
1994	4 NA	4 NA	4 NA	4 NA	4 NA

¹ Full proposals only. Southern and North Central Regions use a proposal process, while the Northeastern and Western Regions request full proposals.

² Includes "Farmer Initiated Grants Program."

³ FY 1994 "Farmer Initiated Grants Program" request for proposals will not be issued until June.

⁴ FY 1994 information not available.

Mr. DURBIN. How will the increase of \$1,425,000 proposed for fiscal year 1995 be used?

Dr. JORDAN. It is anticipated that up to \$100,000 would be used for national initiatives as identified in the 1990 Farm Bill and that the remainder would be divided equally among the four regional Administrative Councils for competitive grants. For every proposal that is currently funded, at least one other fundable project re-

ceives no funds. Priority areas of emphasis that could benefit from additional funding include whole farm and ranch analysis, quality of life, policy impacts on the adoption of sustainable agriculture practices, soil resource management, pesticide alternatives, economics of sustainable production systems, and farmer-to-farmer networking.

Mr. DURBIN. Please list the four regional councils, their membership, and their annual budget.

Dr. JORDAN. The members of the four Sustainable Agriculture Research and Education—SARE—Program Administrative Councils and the 1994 SARE budget allocations for each region will be provided for the record.

[The information follows:]

Sustainable Agriculture Research and Education Program
Regional Administrative Councils.

Northeast Region Administrative Council:

Alice Jones	USDA/CSRS (D.C.)
Anthony Potenza	Farmer (New York)
John Merrill	Farmer (New Hampshire)
William Doeppens	Farmer (Maryland)
Elizabeth Henderson	Farmer (New York)
Julia Freedgood	Non-Profit Private (MA)
Neill Schaller	Non-Profit Private (MD)
Patrick Madden	USDA/CSRS (California)
Jim Bushnell	USDA/ES (D.C.)
Robert Miller	SAES & SCES (RI)
William Lacy	SAES (Pennsylvania)
Gordon Marten	USDA/ARS (Maryland)
E. Demisse	SAES (Maryland)
Marcus Safley	USDA/SCS (D.C.)
Harry Wells	USEPA (D.C.)
Brian Mrazik	USGS (New Hampshire)
Karl Valley	State Ag. Dept. (PA)
Fred Magdoff	SARE Program Coord. (VT)

Southern Region Admin. Council:

Alice Jones	USDA/CSRS (D.C)
Raymond E. Campbell	SCES (Oklahoma)
Tim Hale	USGS (Georgia)
Alex Hitt	Farmer (No. Carolina)
James Horne	Non-Profit Private (OK)
John Ikerd	USDA/ES (Missouri)
Gerald Jubb	SAES (Virginia)
Rick Kocurek	Farmer (Texas)
Bryce Malone	State Ag. Dept. (Louisiana)
Bob Odum	" " "
Lorna McMahon	Farmer (Texas)
Charles A. Onstad	USDA/ARS (Texas)
Charles Panton	1890 Research Directors (NC)
Jerry Pennick	Non-Profit Private (Georgia)
Walter Rowden	Farmer (Arkansas)
Marcus Safley	USDA/SCS (D.C.)
Melba Smith	Non-Profit Private (Mississippi)
Tom Trantham	Farmer (South Carolina)
Gene Turpin	Farmer (Kentucky)
Noble Usherwood	Agribusiness (Georgia)
Donald Voth	Univ. - Qual. of Life (AR)
Harry Wells	USEPA (D.C.)
Savannah Williams	Farmer (Virginia)
Jerry Arkin	SARE Program Coord. (GA)

North Central Region Admin. Council:

Ken Taylor	Non-Profit Private (MN)
Tom Guthrie	Farmer (Michigan)
Ray Berry	Farmer (South Dakota)
Gary Young	Farmer (Nebraska)
Don Holt	SAES (Illinois)
Eldon Ortman	SAES (Indiana)
Gordon Bultena	SCES (Iowa)
Hans Kok	SAES (Kansas)
Phil Larsen	SCES (Minnesota)
Michael Russelle	Co-chair Technical Comm.
Julie Elfving	Co-chair Technical Comm.
Frederick Madison	USGS (Wisconsin)
Mary Hanks	State Dept. of Agric. (MN)
Jerry DeWitt	SCES (Iowa)
Frieda Eivazi	SAES (Missouri)
Millie Bartlett	Non-Profit Private (Ohio)
Richard Klemme, Chair	SCES (Wisconsin)
Eldean Gerloff	USDA/ARS (Illinois)
Clarence Maesner	USDA/SCS (Oregon)
Harry Wells	USEPA (D.C.)
Patrick Madden	USDA/CSRS (California)
Steve Waller	SARE Program Coord. (Nebraska)

Western Region Admin. Council:

Alice Jones	USDA/CSRS (D.C.)
Eric Davis	Rancher (Idaho)
Jim Dyer	Non-Profit Private (Colorado)
Robert D. Heil	SAES (Colorado)
Jim Bushnell	USDA/ES (D.C.)
Janet Hren	USGS (California)
Patrick Madden	USDA/CSRS (California)
Clarence Maesner	Rural Dev. Spec. (Oregon)
Robert Reginato	USDA/ARS (California)
Jerry Schickendanz	SCES (New Mexico)
Larry Thompson	Farmer (Oregon)
Harry Wells	USEPA (D.C.)
David E. Schlegel	SARE Program Coord. (CA)

**FY 1994 Sustainable Agriculture Research and Education Budget
Including Agriculture in Concert with the Environment Budget)**

SARE (Chapter 1)	Income	Expenditures	Balance
CSRS Appropriation	\$7,400,000		\$7,400,000
Administration			
Fed. Admin. 3%		\$ 222,000	\$7,178,000
SBIR 1.5% of balance		\$ 107,670	\$7,070,330
Associate Director Office		\$ 140,000	\$6,930,330
Administrative Subtotal		\$ 469,670	\$6,930,330
Match to ACE		\$ 624,000	\$6,306,330
SARE RESOURCES AVAILABLE			\$6,306,330
<u>SARE NATIONAL INITIATIVES</u>			
Agricultural Library		\$ 110,000	
SAN		\$ 225,000	
PLANETOR		\$ 25,000	
MSU Coop. Agreement		\$ 25,000	
PSU Coop. Agreement		\$ 25,000	
National Program Evaluation		\$ 50,000	
Special Projects		\$ 45,770	
New Initiative		\$ 25,000	
National Initiatives Subtotal		\$ 520,770	\$5,785,560
<u>SARE REGIONAL INITIATIVES</u>			
Northeast Region		\$1,445,140	
Southern Region (1)		\$1,450,140	
North Central Region		\$1,445,140	
Western Region (2)		\$5,785,560	
BALANCE			\$0

**FY 1994 Sustainable Agriculture Research and Education Budget
(Including Agriculture in Concert with the Environment Budget)**

ACE	Income	Expenditures	Balance
EPA Appropriation	\$650,000		\$ 650,000
Administration 4%		\$ 26,000	
Administrative Subtotal		\$ 26,000	\$ 624,000
Match from SARE	\$624,000		\$1,248,000
ACE RESOURCES AVAILABLE			\$1,248,000
<u>ACE NATIONAL INITIATIVES</u>			
ERS		\$ 310,000	
National Initiative Subtotal		\$ 310,000	\$ 938,000
<u>Ace Regional Initiatives</u>			
Northeast Region		\$ 234,500	
Southern Region		\$ 234,500	
North Central Region		\$ 234,500	
Western Region		\$ 234,500	
Regional Subtotal		\$ 938,000	
BALANCE			\$0

**FY 1994 Sustainable Agriculture Research and Education Budget
(Including Agriculture in Concert with the Environment Budget)**

<u>RESOURCES AVAILABLE</u>	\$8,050,000	\$8,050,000
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EXPENSES

Regional SARE Programs	\$5,065,560
Regional ACE Programs	\$ 938,000
Regional Administrative (3)	\$ 720,000
National SARE Initiatives	\$ 520,770
National ACE Initiatives	\$ 310,000
National Administration (4)	\$ 495,670

TOTAL	\$8,050,000	\$8,050,000
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- (1) Includes \$35,000 for a special one-year demonstration project.
 - (2) Includes \$30,000 for the regional office transition from the University of California-Oakland to Utah State University.
 - (3) Regional administrative budgets are currently being submitted for review and approval estimated at \$180,000 per region.
 - (4) Includes \$140,000 for the associate director's office.

ADMINISTRATIVE COSTS

Mr. DURBIN. Please list the administrative or overhead costs of each regional council.

Dr. JORDAN. Administrative costs for the regional Administrative Councils for fiscal year 1994 are being prepared for submission at this time. Administrative costs for fiscal year 1993 are as follows: Western Region, \$178,576; Northcentral Region, \$178,220; Southern Region, \$194,533; and Northeast Region, \$179,000.

USDA SUSTAINABLE AGRICULTURE PROGRAM

Mr. DURBIN. Please provide for the record the USDA funds related to sustainable agriculture, by agency, for fiscal years 1993, 1994, and 1995.

[The information follows:]

U.S. DEPARTMENT OF AGRICULTURE—SUSTAINABLE AGRICULTURE

[In thousands of dollars]

Agency	Fiscal year—		
	1993	1994	1995
Agricultural Research Service	\$165,647	\$169,643	\$169,599
Cooperative State Research Service	90,061	95,257	95,199
Extension Service	23,200	26,422	30,422
National Agricultural Library	57	41	41
Economic Research Service ¹	(195)	(310)	(310)
Total, USDA	278,965	291,363	295,261

¹ Funds are reimbursed from CSRS.

HIGHER EDUCATION

Mr. DURBIN. How many doctoral students and masters fellows are being supported with the \$3,500,000 provided for fiscal year 1994 and how does that compare with fiscal year 1993?

Dr. JORDAN. Funding for master's fellows was discontinued in fiscal year 1986 when funding dropped from \$5,000,000 to \$3,000,000. We anticipate that 63 doctoral fellows will be supported with the \$3,500,000 provided in fiscal year 1994, just as in 1993. However, the proposals to this program for 1994 funding are due by early May. A panel of experts will meet in mid-June to give us advice on the merits of the proposals.

Mr. DURBIN. How are the challenge grants funds being used in fiscal year 1993?

Dr. JORDAN. Ninety-six Challenge Grant projects were funded at 45 institutions in 32 states in 1993. Regional distribution is: North Central 35 projects, Southern 29, Western 20, and North Eastern 12. Most projects funded by Challenge Grants in fiscal year 1993 address more than one targeted need area. The primary national need areas funded are: curriculum development—28 projects; faculty preparation—16 projects; instruction delivery systems—33 projects; and student experiential learning—19 projects.

Mr. DURBIN. When will the fiscal year 1994 grants be awarded?

Dr. JORDAN. The 1994 Challenge Grant Program has received 105 proposals for the \$1.5 million available. The peer panel reviewing these competitive proposals met March 8 through 11. Awards will be made in June or July 1994.

AG*SAT

Mr. DURBIN. Were any AG*SAT grants awarded in fiscal year 1993?

Dr. JORDAN. The Challenge Grant Program supports four different types of projects to strengthen undergraduate education, one of which is innovative delivery systems. Requests to support AG*SAT projects fall within this category. In the Challenge Grants Program money is not targeted for any specific type of project. Therefore, no funds are devoted exclusively to AG*SAT. Rather, we work very closely with our university cooperators to promote innovative types of projects, such as AG*SAT, so that universities can take advantage of opportunities afforded by this program. This approach seems to be working, since in 1993 we received 8 proposals for AG*SAT-related projects which requested a total of almost \$630,000. Several awards were made by the higher education grants programs in fiscal year 1993 to projects utilizing distance learning technologies. Not all of these specified whether AG*SAT would be the chosen modality. Three 1890 Institution Capacity Building Projects funded in fiscal year 1993 will deliver courses by means of AG*SAT. These 3 projects, located at North Carolina A&T State University and at Florida A&M University, were awarded a total of \$534,647.

Mr. DURBIN. What are the plans for fiscal year 1994?

Dr. JORDAN. We always encourage the submission of diverse types of projects in our Challenge Grants and Capacity Building Grants Programs. Fiscal year 1994 will be the same. Funding will continue to be based on the merits of the proposals. We anticipate that some of these each year are likely to be distance learning projects, including those delivered by means of AG*SAT. We continue to dialogue and interact with the AG*SAT organization and the university system to promote innovative course delivery through telecommunications. We are encouraging AG*SAT-related proposals for competitive grants in both the Challenge Grants Program and the 1890 Capacity Grants Program. We anticipate that such proposals will continue to be successful in securing information through these two programs.

FEDERAL ADMINISTRATION

Mr. DURBIN. Would you please provide for the record an object classification table for Federal administration, including all funds available for that purpose for fiscal years 1993, 1994, and 1995?

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE

CLASSIFICATION BY OBJECTS FOR FEDERAL ADMINISTRATION FUNDS FISCAL YEAR 1993 AND
ESTIMATED 1994 AND 1995

[In thousands of dollars]

	1993	1994 ¹	1995
Personnel Compensation:			
11 Total personnel compensation	\$8,790	\$9,574	\$9,807
12 Personnel benefits	1,713	1,868	1,913
13 Benefits for former personnel			

CLASSIFICATION BY OBJECTS FOR FEDERAL ADMINISTRATION FUNDS FISCAL YEAR 1993 AND
ESTIMATED 1994 AND 1995—Continued

[In thousands of dollars]

	1993	1994 ¹	1995
Total personnel compensation and benefits	10,503	11,442	11,720
Other objects:			
21 Travel	1,300	1,316	1,044
22 Transportation of things	51	51	39
23 Communications, utilities and misc. charges	1,071	1,292	1,003
24 Printing and reproduction	456	492	386
25.1 Consulting Services	187	215	237
25.2 Other services	882	1,136	39
25.3 Purchases/Goods and Services	1,998	2,043	346
25.4 Operation of GOCO's			
25.5 Res. and Dev. Contracts			
26 Supplies and materials	259	259	213
31 Equipment	306	306	247
41 Grants, subsidies, and contributions	19,464	19,060	10,234
Total, other subjects	25,974	26,170	13,788
Total Direct Obligations	36,477	37,612	25,508
Staff Years	225	235	235

¹ Reflects rescissions.

CONSULTING SERVICES

Mr. DURBIN. In fiscal years 1992 and 1993, you budgeted \$203,000 for consulting services. How were these funds used?

Dr. JORDAN. The Cooperative State Research Service uses the peer panel review process to evaluate grant proposals submitted under the Special Research Grants program, the National Research Initiative Competitive Grants program, the Higher Education Grants program, the Biotechnology Risk Assessment program, and the Small Business Innovation Research Program. Non-Federal members of the peer panels are paid an honorarium of \$150 per day for their services at the peer panel meetings. These honorarium costs are classified as consulting services.

PEER PANELS

Mr. DURBIN. How much did CSRS pay out in honoraria and travel for peer panels in fiscal year 1993? What is the budget for fiscal year 1994?

Dr. JORDAN. In fiscal year 1993, honoraria costs were \$186,650 and travel costs were \$406,944. In fiscal year 1994, estimated costs for honoraria and travel are \$215,000 and \$460,000 respectively.

Mr. DURBIN. Please provide a table for the record listing honoraria and travel, by program, for fiscal year 1993.

[The information follows:]

CSRS FISCAL YEAR 1993 PEER PANEL HONORARIA AND TRAVEL COSTS

Program	Costs—		
	Travel	Honoraria	Total
Higher Education:			
19890 Capacity Building Grants	\$16,038	\$7,500	\$23,538
Challenge Grants	11,699	5,600	17,299
Graduate Fellowships	10,651	3,300	13,951
Subtotal, Higher Education	38,388	16,400	54,788
Special Grants:			
Aquaculture	4,792	1,500	6,292
Biotechnology Risk Assessment	7,024	2,700	9,724
Water Quality	37,933	18,000	55,933
Rangeland	1,092		1,092
Wood Utilization	700		700
Subtotal, Special Grants	51,541	22,200	73,741
National Research Initiative Competitive Grants Program	279,760	134,850	414,610
Small Business Innovation Research Grants Program	37,255	13,200	50,455
Total	406,944	186,650	593,594

CENTER FOR AGRICULTURE AND RURAL DEVELOPMENT

Mr. DURBIN. Please provide a description of the work that has been done under the center for agriculture and rural development program.

Dr. JORDAN. The research provides background information on international trade in agriculture and analyses of the implications of trade policy alternatives on the agricultural sector of the United States and other countries. The fiscal year 1994 grant proposal has been received by CSRS and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. Trade negotiations and outcomes are of interest to policymakers and agricultural producers.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to provide analytical support to the government officials to assess and evaluate various proposals affecting agricultural trade.

A large number of analyses and studies on policy issues and topics pertaining to the Uruguay round of negotiations have been completed and provided to the negotiators. Studies include the development of international trade models and assessments of trade options for meat, dairy, grains and oilseeds. Analyses include determination of the implications of export subsidies, import protection, and internal support.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. This research program was initiated in fiscal year 1989. Grants have been awarded from funds appropriated as follows: fiscal year 1989, \$750,000; fiscal years 1990 and 1991, \$741,000 per year; fiscal years 1992–1993, \$750,000 per year; and

fiscal year 1994, \$705,000. A total of \$4,437,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal years?

Dr. JORDAN. The non-federal funds and sources provided for this grant as follows: \$111,210 State appropriations and \$175,616 miscellaneous for a total of \$286,826 in 1991; \$113,779 State appropriations and \$173,117 miscellaneous for a total of \$286,896 in 1992; and \$120,138 State appropriations and \$164,707 miscellaneous for a total of \$284,846 in 1993. Final determination has not been made for the allocation of non-federal funds for this project in fiscal year 1994.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The research program is carried out by the Center for Agriculture and Rural Development at Iowa State University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work should be completed following analysis of the final agreement of the Uruguay Round, and dissemination of these results.

HERD MANAGEMENT, TENNESSEE

Mr. DURBIN. Please provide a description of the research that has been done under the herd management grant.

Dr. JORDAN. The research plan was developed in 1991. Research to date has focused on the comparison of two systems of herd management and evaluate the effect of preweaning protocols on growth performance and carcass quality of genetically lean beef.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The purpose of this research is to produce a high quality, low fat beef product that meets the demands of an increasingly health conscious public. Effects are underway to study the nutritional properties and health aspects of lean beef.

Mr. DURBIN. What is the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal is to use selective breeding and management of cattle to produce lean meat. Preliminary data suggest that genetically lean animals exhibit faster growth performance and reach market weight faster. The carcasses have a greater proportion of muscle to bone and muscle to fat compared to control groups.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991 and the appropriation for fiscal year 1991 was \$375,000. The 1992 and 1993 appropriation was \$475,000 per year and the fiscal year 1994 appropriation is \$576,000. A total of \$1,901,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided were as follows: \$2,675 State appropriations, \$1,862 product sales and

\$2,000 miscellaneous in 1991; \$2,675 state appropriations, \$22,697 product sales and \$2,000 miscellaneous in 1992; and \$2,782 State appropriations, \$56,803 product sales and \$2,000 miscellaneous in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being carried out by scientists at Tennessee State University, and other locations in cooperation with Genetic Research and Management Company in Tennessee.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The investigators anticipate that this research will be completed in fiscal year 1997.

GULF COAST SHRIMP AQUACULTURE

Mr. DURBIN. Please provide a description of the research that has been funded under the Gulf Coast Shrimp Aquaculture grant.

Dr. JORDAN. Work under this program has addressed important research needs necessary for the development of a U.S. marine shrimp farming industry. Studies have been conducted on growout intensification, prevention and detection of diseases, seed production, and the development of specific pathogen free stocks. Performance trials in various production systems have been conducted. Maturation and reproductive performance in seed production systems has reached commercial feasibility. Protocols for viral detection have been improved and have led to the development of specific pathogen free stocks of commercial importance.

In fiscal year 1994, emphasis will be placed on the industry seed supply and shrimp disease control. Research will continue in the areas of culture system technologies, economics, regulations and marketing. Research in the area of environmental aspects of shrimp culture will be expanded. The fiscal year 1992 grants to Hawaii and Mississippi extend through January 1993 and December 1993, respectively. The fiscal year 1994 grant proposals have been received and are currently being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. There is a potential to enhance domestic production of marine shrimp through aquaculture in order to reduce the annual trade deficit in marine shrimp, which is approximately \$2 billion. Research could improve the supply of high quality seed, to improve shrimp health management, and enhance production efficiency in shrimp culture systems. The U.S. has the opportunity to become a major exporter of shrimp seed and broodstock, disease control technologies and product and services.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to increase domestic production of marine shrimp through aquaculture. Studies have been conducted on growout intensification, prevention and detection of diseases, seed production, and the development of specific pathogen free stocks. Maturation and reproductive performance in seed production systems are now commercially feasible. Protocols for viral detection have been improved and have led to the development of

specific pathogen free stocks. These specific pathogen free stocks have been evaluated in most of the commercial shrimp farms in the U.S. and have demonstrated consistently superior performance over previous stocks leading to a more profitable industry. The development of these stocks has also established the U.S. as the primary source of specific pathogen free shrimp seed world wide.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, \$1,050,000; fiscal year 1986, \$1,236,000; fiscal year 1987, \$2,026,000; fiscal year 1988, \$2,236,000; fiscal year 1989, \$2,736,000; fiscal year 1990, \$3,195,000; fiscal year 1991, \$3,365,000; fiscal years 1992-1993, \$3,500,000 per year; and fiscal year 1994, \$3,290,000. A total of \$26,134,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The U.S. Marine Shrimp Farming Consortium estimates that non-federal funding for this program approaches 50 percent on the Federal funding for fiscal year 1991-1994. Funding sources include state and miscellaneous categories. In-kind contributions from the industry are not included in their total but are substantial, as the program is dependent upon industry cooperation to carry out large scale commercial trials.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is being carried out through grants awarded to the Oceanic Institute, Hawaii and the Gulf Coast Research Laboratory in Mississippi. In addition, research is conducted through subcontracts at the University of Southern Mississippi, Tufts University, the Waddel Mariculture Center in South Carolina, the Texas Agricultural Experiment Station, and the University of Arizona.

Mr. DURBIN. When do the principal researchers anticipate that this research will be completed?

Dr. JORDAN. The researchers anticipate that the specific research outlined in the current proposal will be completed in fiscal year 1995.

VOCATIONAL AQUACULTURE EDUCATION

Mr. DURBIN. Please provide a description of the research that has been funded under the Vocational Aquaculture Education grant.

Dr. JORDAN. In 1990, Congress, through USDA's Office of Higher Education Programs, began funding a multi-year project to: develop curricula and support materials, field test content, and conduct national teacher training on the materials. In 1991, utilizing the new instructional materials, schools in Texas, Iowa, Indiana, South Carolina, Pennsylvania and Washington were selected to field test the curriculum. They completed the field tests in January 1992. In August 1992, teacher teams from all 50 states received training in Raleigh, North Carolina on how to teach the material. Additionally, a recirculating systems manual was developed and instructors explored a model classroom recirculating system designed and built in cooperation with North Carolina State University. Some 2,000

copies of the 1,100 page, five volume core curriculum and support materials were sent to all states in the fall of 1992. State replicated the training program at their own teacher workshops in 1993. In addition, grant funds were used to develop and test 16 species-specific curriculum modules, complete and test the recirculating systems manual, support additional regional in-service training, design outreach programs to culturally diverse audiences, and begin development of units on biotechnology and sustainable agriculture as they relate to aquaculture. In September 1993, in-service training for the 1,890 Land-Grant Colleges and Universities was held at North Carolina A&T University in Greensboro, North Carolina. The 1993 grant was extended at no cost in September 1993 to allow for completion of writing and testing of the species-specific curricula and for initial layout and design of teaching materials.

The 1994 grant will be used to print and distribute the species-specific materials, develop a national in-service training center for secondary aquaculture education, support regional learning centers and other outreach programs for multicultural audiences and inner-city schools complete the sustainable agricultural and biotechnology units, produce and distribute consumer information on aquaculture, and conduct an evaluation of the vocational aquaculture curriculum project.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Prior to this project, there were very few curriculum or teaching materials on aquaculture available for local schools and teachers were not prepared to teach this subject.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. Funds were originally appropriated by Congress to determine if curriculum materials existed and to what extent; what additional materials were needed; and if it was possible to provide these materials, train teachers, and conduct a quality aquaculture education program in the secondary and postsecondary schools. We have fully met and far exceeded these goals. To date, a new curriculum has been developed and tested, instructional materials have been distributed to all 50 states, teacher teams from all states have received training at a national workshop and additional in-service training has been provided by the states. Results from the six test sites report a 50 to 400 percent increase in students applying to study aquaculture and the integration of math and science into the curriculum with the full cooperation of teachers in other disciplines.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. A total of \$2,217,000 has been appropriated for this program—\$247,000 in fiscal year 1990, \$500,000 per year in fiscal years 1991 through 1993, and \$470,000 in 1994.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. We know that two of the test site schools have invested over \$3 million of their own money in the project. Complete

information from the other sites is not currently available but will be included in the project evaluation conducted as part of the 1994 fiscal year grant activities.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is being coordinated by the National Council for Agricultural Education headquartered in Alexandria, Virginia. The six site schools are located in Texas, Iowa, Indiana, South Carolina, Pennsylvania and Washington. Other work has been conducted at North Carolina State University in Raleigh, North Carolina and at North Carolina A&T State University in Greensboro, North Carolina. The curriculum is being disseminated in all 50 states and U.S. Territories in the Caribbean and the Pacific and the state are conducting their own additional in-service training.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The principal investigators have indicated that they may request one additional year of funding to enable them to update the curriculum modules and expand the dissemination process.

WATER QUALITY—NORTH DAKOTA

Mr. DURBIN. Please provide a description of the research that has been funded under the water quality program grant.

Dr. JORDAN. The overall objective of the research is to provide meaningful data on the transport, fate and attenuation of agricultural chemicals in groundwater. Seven field sites have been instrumented in North Dakota and data collection, data analysis and reporting of results is progressing.

An experiment to assess the role of root channels and soil fractures as they contribute to macropore flow of water and chemicals has been completed at two field locations. In addition to the role of soil physical factors in the fate and transport of agricultural chemicals, microbial processes are being investigated.

The research results are being analyzed and manuscripts prepared for publication. During the coming year considerable research effort will be devoted to preparation of manuscripts and dissemination of information on research results.

Fiscal year 1993 grant funds are supporting research through August 1996. The 1994 proposal has been received and is being processed for award.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The objective of the groundwater research program is to provide a scientifically valid basis upon which meaningful agricultural chemical management and regulatory decisions can be made. Chemicals in groundwater present both a public health problem and an environmental quality problem of significant short-term and long-term importance.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of the research is to understand the occurrence, transport, and fate of agricultural chemicals in

groundwater under various representative field sites. Seven field sites in North Dakota differing in agricultural practices, geology and hydrogeology have been instrumented to collect water quality data. Data collection and analyses are continuing on a regular basis at four primary sites. A second fracture test was completed. Based on initial results, the water transport flow mechanisms are variable at the site tested. Microbial data, collected at two sites, showed that the microbial activity is low at both sites.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. In 1989, \$1.0 million was appropriated under the ground water research program. Beginning in 1990, funds have been earmarked under the Direct Federal Administration program. Work supported by this grant was initiated in fiscal year 1990 with an appropriation of \$987,000. Subsequent appropriations have been \$750,000 in fiscal year 1991, \$500,000 per year in fiscal years 1992-1993; and \$470,000 in 1994. A total of \$4,207,000 has been appropriated for this water quality research program.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The Energy and Environmental Research Center at the University of North Dakota indicated that no non-federal funds have been provided for this grant.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of North Dakota through its Energy and Environmental Research Center. A portion of the pesticide research was sub-awarded to North Dakota State University.

Mr. DURBIN. When do the principal researchers anticipate that this research will be completed?

Dr. JORDAN. The current funded project supports research through fiscal year 1996. The research proposal currently under review has a proposed completion date of September, 1997.

WATER QUALITY—ILLINOIS

Mr. DURBIN. Please provide a description of the work that has been funded under the Water Quality program grant.

Dr. JORDAN. The purpose of the research is to provide a scientifically valid basis upon which meaningful agricultural chemical management and regulatory decisions affecting groundwater can be made. The research is conducted under the Illinois Groundwater Consortium and coordinated from the Southern Illinois University at Carbondale—SIUC—campus. The Consortium has supported research from the very basic to the applied. Example topics currently under study include herbicide movement/tillage practices, protection of water quality in watersheds, modeling transport of agricultural chemicals, grass buffer strips for pollution reduction, and policy alternatives to reduce agricultural chemicals in public water supplies.

The Consortium includes investigators from several Illinois agencies. A research conference and planning session is conducted each spring with results published in a proceedings.

The program on Water Quality in Illinois builds upon research initiated in fiscal year 1990. The fiscal year 1993 grant supports research through September 1995. A research planning meeting is scheduled in March following which the fiscal year 1994 proposal will be submitted.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Our understanding of the interaction of pesticides with soil and groundwater is inadequate. The goal of this research is to determine the short-term and long-term effects of chemicals applied to the soil upon groundwater quality. Information is needed at a local level on the occurrence, transport and fate of agriculture chemicals in various hydrogeological settings.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The Illinois Groundwater Consortium was established to coordinate and support research on agricultural chemicals in Illinois groundwaters. The research team has accomplished an improved understanding of the fate and movement of agricultural chemicals under Illinois crop production conditions. A publication supported by the Consortium entitled, "Buried Treasure: 50 Ways Farmers Can Protect Their Groundwater," has received widespread acceptance and use for lay audiences.

The Illinois Groundwater Consortium has accomplished a major step toward coordination and exchange of information/research results relating to groundwaters in Illinois. The Groundwater Bulletin issued in December 1993 reports research results from the Consortium. The Bulletin reports on atrazine studies, nitrogen management, farming practices for more efficient chemical use, geological impacts and policy options to safeguard groundwaters.

The Consortium investigators took an active role in monitoring and investigating herbicide, pesticide and coliform impacts during the Mississippi River Flood of 1993. The findings from this study will be useful in restoring the flooded cropland to full productivity.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Research grants have been awarded from funds appropriated as follows: fiscal year 1990, \$494,000; fiscal year 1991, \$600,000; and fiscal years 1992-1993, \$750,000 per year; and fiscal year 1994, \$705,000. A total of \$3,299,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. The non-federal funds and sources provided for this grant were as follows: \$255,891 state appropriations in 1991; \$447,237 state appropriations in 1992; and \$644,054 state appropriations in 1993.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. The work is being carried out by the Illinois Groundwater Consortium and coordinated by the Carbondale campus of Southern Illinois University. The research is being conducted by staff at the University of Illinois, Southern Illinois Uni-

versity, the Illinois State Geological Survey and the Illinois Water Survey at locations across the State.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The plans for fiscal year 1994 funding will be completed in April 1994 for research to be conducted through fiscal year 1996.

ALTERNATIVE FUELS CHARACTERIZATION LAB

Mr. DURBIN. Please provide a description of the research that has been funded under the alternative fuels characterization laboratory research grant.

Dr. JORDAN. The alternative fuels characterization research examines the utility of using bio-mass derived fuels.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. This is the only laboratory in the nation devoted to studying the alternative fuel characteristics. Data developed in this lab provided important information regarding the volatilization of ethanol-containing fuels that responded to EPA concerns of vapor pressures.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The initial goal continues to be the goal of the laboratory—to promote the use of biomass-derived fuels in an environmentally-sound manner. This project provides quarterly reports and responses to questions. There is an active information program including representing North Dakota at the Governors Ethanol Coalition, radio, television, and newspaper reports and technical reports to scientific communities. Commercial fuels are affected during blending, transportation, and storage. Fuel volatility and evaporation are of concern. Rates and emissions of evaporating fuels, including one containing ten percent ethanol, showed that ethanol was not immediately evaporated. Ozone-forming potential of individual compounds in fuel-evaporative and exhaust emissions were defined. Also, detailed analysis of gasoline and gasoline and gasoline vapors, the effects of butanes on fuel volatility, and the addition of ethanol to methyl tertiary-butyl ether have been made and results published.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. The work supported by this grant began in fiscal year 1991, and the appropriations for fiscal years 1991 through 1993 were \$250,000 per year; and it is \$235,000 in 1994. A total of \$985,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. We have data from 1993. Funds received from the National Corn Growers Association and the Renewable Fuels Association amounted to \$59,500. The University of North Dakota faculty and technician's salaries dedicated to this project were \$74,000.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at The University of North Dakota, Energy and Environment Research Center.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The University researchers anticipate that work may be completed in fiscal year 1996.

MISSISSIPPI VALLEY STATE UNIVERSITY

Mr. DURBIN. Please provide a description of the research that has been funded under the Curriculum Development and Strengthening-Mississippi Valley State University grant.

Dr. JORDAN. Mississippi Valley State University has used these funds for strengthening and curriculum development. A degree program in communication has been added to the curriculum. Student enrollment has had a five year increase beginning with the fall semester 1989. Classes continue to be modified to reflect the agrarian environment from which most of the students come and many will be employed. These funds continue to assist the university in enhancing the curriculum and to generally make the university stronger and more effective in program delivery and administration.

The fiscal year 1993 grant supports work through June 1, 1994. The fiscal year 1994 grant has been received and is being reviewed.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The primary need for this project is to satisfy a local need. The need is for strengthening and curriculum development at Mississippi Valley State University.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal was to fiscally strengthen the university and to develop strong updated curricula. The elimination of the University's budget deficit and the operation on a sound fiscal basis are major accomplishments for this program. Because of these funds the regional accreditation for the University has been achieved for a full 10 years. The expansion and modernization of the curriculum have given the students improved opportunities for employment. The enhanced positive financial reality and the improved curriculum offerings have improved the University's reputation as reflected in sustained increases in student enrollment.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. This program was initiated in fiscal year 1987. Grants have been awarded from funds appropriated as follows: fiscal year 1987, \$750,000; fiscal years 1988 and 1989, \$625,000 per year; fiscal year 1990, \$617,000; fiscal year 1991, \$642,000; fiscal years 1992-1993, \$668,000 per year; and fiscal year 1994, \$628,000. A total of \$5,223,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Mississippi Valley State University received State and private funding during the period of this grant. The State fig-

ures provided here are for enhancement funds gained above the University's standard formula generated funds. The source and amounts will be provided for the record.

[The information follows:]

SOURCE

Fiscal year	State	Private	Total
1987	0	\$168,640	\$168,640
1988	0	186,036	186,036
1989	\$68,658	190,258	258,916
1990	207,879	369,358	577,237
1991	333,263	337,700	670,963
1992	349,427	470,220	819,647
1993	35,750	358,680	394,430

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. These funds are intended to strengthen programs at Mississippi Valley State University. The total program has been carried out on the campus of Itta Bena.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The objectives of the current grant will be completed by October 1, 1994.

GEOGRAPHIC INFORMATION SYSTEM

Mr. DURBIN. Please provide a description of the research that has been funded under the geographic information system program.

Dr. JORDAN. This program is not strictly a research project. It is a program for the transfer for evolving technology to state and local governments. Much of the technology associated with the computer graphics and the information content displayed through these graphics has been and largely still is best understood by researchers. The current program evolved from a grant entitled, "Geographic Information System Technology Transfer Project" which was awarded in fiscal year 1990 to the American Farmland Trust. The current grantee, the National Center for Resource Innovations, was created to continue this work of providing a structured, organized program for transfer of Geographic Information Systems technology to local governments. The program has concentrated on establishing regional centers for the transfer of this technology, identifying local needs to be met, assessing the availability of existing National or regional information, developing strategies for information acquisition in situations where such information did not exist, and initial training for local governments.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. Much progress has been made in developing computer based information for improving the management of our natural resources. The work of this program provides linkages from state and local governments to nationally developed data sets and techniques without regard to agency and/or department of government. While concentrating on issues related to agriculture, the independent, non-profit nature of the National Center for Resource

Innovations facilitates linkages across disciplinary and institutional barriers.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. The original goal of this work was to serve as a pilot project for the transfer of rapidly emerging geographic information systems technology to local governments as related to natural resources. Regional sites were established to accomplish this goal. Most sites are located at and affiliated with academic institutions. Each site has focused on locally important natural resource issues. After a year in which major changes were made to more carefully focus the efforts of the program, a much more coherent organization has evolved. The role of the Chesapeake project has been delineated from the National Office and associations have developed between the Chesapeake project and surrounding states to restore the biological health of this important and unique water body. A strategy now exists for sharing materials and transferring information. Specific sites have taken on responsibility for providing expertise in categorical areas. Plans for participation in a variety of national conferences, monitoring of technology diffusion, and relating to general public and specific advisory groups have been jointly developed.

The fiscal year 1993 grant supports work under this program through May 1994. The proposal for work in 1994 has been received and is being reviewed. It is anticipated that when awarded this grant will support work through May 1995.

Mr. DURBIN. How long has this work been under way and how much has been appropriated through fiscal year 1994?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1990, \$494,000; fiscal year 1991, \$747,000; fiscal years 1992 and 1993, \$1,000,000 per year; and fiscal year 1994, \$1,011,000. A total of \$4,252,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. For fiscal year 1990 through fiscal year 1993 the work in this program had \$1,819,856 non-federal support. In fiscal year 1990 non-federal support was \$714,940 consisting of equipment, data bases, and other miscellaneous contributions from foundations, city, and state governments. In fiscal year 1991 non-federal support was \$25,000 from county government. In fiscal year 1992 non-federal support was \$366,016 from county government, computer companies, and state governments consisting of equipment, software, facilities, and miscellaneous support. In fiscal year 1993 non-federal support was \$713,900 consisting of financial and miscellaneous support from foundations, county and state governments.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. the National Center for Resource Innovation Chesapeake Bay center is located in Rosslyn, Virginia, and is working jointly with the State Conservationists of those states impacting the Bay but in particular with Pennsylvania and Virginia. The Chesapeake Bay project continues work in two counties of these states, Lebanon County, Pennsylvania, and Clarke County, Virginia. Other work is being accomplished in other regional centers.

The southeastern center, in Valdosta, Georgia, in affiliation with the South Georgia Regional Development Center, has focused on Geographic Positioning Systems and property issues. The southwestern center, in Fayetteville, Arkansas in affiliation with the University of Arkansas, has focused on training of local government personnel and serves the group as a center for expertise in using the GRASS system. In Ellensburg, Washington, in affiliation with Central Washington University, the northwest center focuses on training in the ARC/INFO system for use in state planning. The north central center in Grand Forks, North Dakota, in affiliation with the University of North Dakota, is focused on integrating national and local weather data with local needs. The University of Wisconsin-Madison, functioning as the Great Lakes center, continues a long history of involvement in the application of this technology at the local level with strong focus on soils/land-use and the social aspects of the integration of a new technology.

Mr. DURBIN. When do the principal researchers anticipate that this research will be completed?

Dr. JORDAN. At the current rate of funding, the researchers anticipate that this technology will be generally available and accessible in three to four years.

CENTER FOR NORTH AMERICAN STUDIES, TEXAS

Mr. DURBIN. Please provide a description of the work that has been done under the Center for North American Studies program.

Dr. JORDAN. The purpose of this grant is to support a program to study issues between the United States and Mexico, including trade, joint research, and socioeconomic issues. This is a new grant. The university has submitted a proposal to CSRS for review.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional, or local need for this research?

Dr. JORDAN. The recently adopted North American Free Trade Agreement raises a number of international and national issues about possible impacts among the three countries and alternatives measures needed to resolve issues. Research is needed to identify measures that will resolve potential socioeconomic conflicts.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date.

Dr. JORDAN. The goal is to promote strong agricultural ties among the three North American countries, ensure the continued competitiveness of U.S. agriculture, and foster greater cooperation among the three countries in resolving critical agricultural issues of common interest. The researchers are currently developing their long-range plan of work and implementation plans.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. JORDAN. Work supported by this grant begins in fiscal year 1994, and the appropriation for fiscal year 1994 is \$94,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. At this time, the university has not allocated any non-federal funds for this new 1994 grant.

Mr. DURBIN. Where is the work being carried out?

Dr. JORDAN. The research program will be carried out at Texas A&M University.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The program of work currently being planned may be completed by 1999.

PM-10 STUDY, CALIFORNIA AND WASHINGTON

Mr. DURBIN. Please provide a description of the research that has been funded under the PM-10 study, California and Washington research grant.

Dr. JORDAN. CSRS has developed a request for proposals with the due date of March 31, 1994.

Mr. DURBIN. According to the research proposal, or the principal research, what is the national, regional, or local need for this research?

Dr. JORDAN. The focus of research conducted under the initial grant examines particulate matter in the air of the San Joaquin Valley in California and the Eastern Washington area. The Environmental Protection Agency has developed a map of those airsheds in noncompliance with the law that requires fewer than four days of more than 150 micrograms/cubic meter of particles less than 10 microns in size.

Mr. DURBIN. What was the original goal of this research, and what has been accomplished to date?

Dr. JORDAN. The goal of this program is to provide the results of research to enable agriculture operations in the affected airsheds to comply with the Clean Air Act of 1990. A meeting was held in which 30 scientists and concerned citizens developed and prioritized the seven most critical researchable topics. A second meeting was held February 15, 1994, to develop the guidelines for a request for proposals for studies to be conducted in the San Joaquin Valley of California and Eastern Washington as specified in the fiscal year 1994 appropriation. We anticipate grants will be awarded in early April.

Mr. DURBIN. How long has this work been underway, and how much has been appropriated, by fiscal year, through fiscal year 1994?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1994 and the appropriation for fiscal year 1994 is \$940,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. This information is not as yet available.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at selected sites in California and Washington.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that work may be completed in fiscal year 1996.

AGRICULTURAL DEVELOPMENT IN THE AMERICAN PACIFIC

Mr. DURBIN. Please provide a description of the work has been done under the Agricultural Development in the American Pacific program.

Dr. JORDAN. CSRS has requested the University of Hawaii to submit a grant proposal for fiscal year 1994 that has not yet been received. The American Development in the American Pacific—ADAP—project is a primary means for Land Grant research, extension, and instruction programs of the five participating institutions—American Samoa Community College, College of Micronesia, Northern Marianas College, University of Guam and University of Hawaii—to collaborate and cooperate to enhance their impact on agriculture and communities. ADAP is a mechanism to address common regional client-based issues while maintaining cultural, rural, economic and environmental integrity.

Mr. DURBIN. According to the research proposal, or the principal researcher, what is the national, regional or local need for this research?

Dr. JORDAN. The five participating institutions are geographically very dispersed yet facing many similar issues which can best be served through extensive networking and communication. ADAP facilitates communication and seeks to raise levels of academic achievement and improve the quality of education.

Mr. DURBIN. What was the original goal of this research and what has been accomplished to date?

Dr. JORDAN. ADAP's original goals are embodied in the 1993 strategic plan, namely to develop human resources within the institutions, to more effectively manage agricultural programs within and among the institutions, and to focus resources available on ADAP mission needs. In communication with the ADAP Directors, CSRS expressed the need for fewer, better funded projects which more directly service the communities of the participating institutions.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year thorough fiscal year 1994?

Dr. JORDAN. This work has been underway for seven years with an annual appropriation of \$650,000 to Extension Service. In fiscal 1994, an appropriation of \$608,000 has been made to CSRS to continue to ADAP program.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. JORDAN. Non-federal funds are not provided. Unspecified in-kind support, such as facilities, equipment and administrative support, are provided by each institution and, in some specific projects, by non-ADAP collaborating institutions.

Mr. DURBIN. Where is this work being carried out?

Dr. JORDAN. This work is being carried out by American Samoa Community College, College of Micronesia, Northern Marianas College, University of Guam, and the University of Hawaii.

Mr. DURBIN. When do the principal researchers carrying out this work anticipate that the work will be complete?

Dr. JORDAN. ADAP institutions anticipate that funding will be needed for a number of years in order to build a sustaining capability.

BUILDINGS AND FACILITIES

Mr. DURBIN. How much in Federal funds will be required to complete construction of facilities that are currently being supported under the existing CSRS Buildings and Facilities Program? Please supply the balance to complete—both the university's estimate and USDA's.

Dr. JORDAN. We will supply the information for the record.
[The information follows:]

Cooperative State Research Service
U.S. Department of Agriculture

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STATUS OF FUNDING
BUILDINGS AND FACILITIES PROGRAM
(All figures in thousands of dollars)

3/30/94 (Rev.)

FACILITY AND LOCATION	TOTAL COST OF FACILITY			COST SHARING					FUNDS APPROP. TO DATE	ADDTL. FED. FUNDS REQ.	
	As Originally Proposed	As Reported to Congress ¹	Current Invt. Est. Cost ²	Requested Federal Share		Non-Federal Share ³		According to Invt.		According to CSRS ⁴	
				According to Invt.	According to CSRS ⁴	Cash	In Kind				
Environmental Stress Laboratory UNIVERSITY OF ARIZONA (Tucson)	4,000	4,000	4,000	2,000	2,000	2,000	0	2,000	0	0	
Center for Alternative Pest Control Research UNIVERSITY OF ARKANSAS (Fayetteville)	3,630	5,200	4,031	2,731	2,731	1,300	0	2,731	0	0	
Agriculture Building UNIVERSITY OF ARKANSAS (Little Rock)	8,351	TBD	8,351	4,000	4,000	4,351	0	1,668	2,332	2,332	
Altern. Pest Control Contain./Quar. Fac. UNIVERSITY OF CALIFORNIA (Davis/River.)	23,200	23,322	35,000	17,500	11,661	7,000	10,500	2,471	15,029	9,190	
Animal Reproduction and Biotech. Lab. COLORADO STATE UNIV. (Fort Collins)	4,800	6,658	5,846	2,923	2,923	2,923	0	320	2,603	2,603	
Agricultural Biotechnology Laboratory UNIVERSITY OF CONNECTICUT (Storrs)	20,000	20,000	20,000	10,000	10,000	10,000	0	0	10,000	10,000	
Poultry Biocontainment Laboratory UNIVERSITY OF DELAWARE (Newark)	7,000	7,000	7,000	3,500	3,500	3,500	0	329	3,171	3,171	
Ctr. for Adv. Water Tech./Energy Systems SAVANNAH STATE COLLEGE (Savannah, GA)	2,292	2,715	2,715	1,449	725	0	1,266	725	724	0	
Biocontainment Research Center UNIVERSITY OF GEORGIA (Athens)	12,440	NR	16,000	8,000	8,000	8,000	0	5,604	2,396	2,396	
Ctr. for Applied Aquaculture Research & Training OCEANIC INSTITUTE (Waimanalo, HI)	10,489	NR	10,489	6,461	8,461	2,028	0	8,461	0	0	

FACILITY AND LOCATION	TOTAL COST OF FACILITY			COST SHARING				FUNDS APPROP. TO DATE	ADDTL. FED. FUNDS REQ.	
	As Originally Proposed	As Reported to Congress ¹	Current Inst. Est. Cost ²	Requested Federal Share ³		Non-Federal Share ²			According to Inst.	According to CSRS ⁴
				According to Inst.	According to CSRS ³	Cash	In Kind			
Agricultural Biotechnology Facilities UNIVERSITY OF IDAHO (Moscow)	12,121	11,800	13,479	5,900	5,900	7,579	0	2,356	3,544	3,544
Biotechnology Center NORTHWESTERN UNIV. (Evanston, IL)	24,400	24,400	24,400	12,000	12,000	12,400	0	1,952	10,048	10,048
Indiana Inst. for Molecular and Cellular Biology INDIANA UNIVERSITY (Bloomington)	30,000	30,000	13,008	6,705	6,705	6,303	0	6,705	0	0
Plant Science Research Center KANSAS STATE UNIVERSITY (Manhattan)	26,850	NR	24,708	12,216	12,216	12,480	0	12,216	0	0
Applied Research and Manpower Training Center UNIVERSITY OF KENTUCKY (Princeton)	1,784	TBD	1,784	897	897	897	0	0	897	897
Red Meat Processing Facility NORTHWESTERN ST. U. (Merchitoches, LA)	150	182	150	71	71	79	0	71	0	0
Inst. for Nat. Resources and Env. Science UNIVERSITY OF MARYLAND (Statewide)	20,000	20,000	24,400	10,000	10,000	14,400	0	3,531	6,489	6,489
Ctr. for Hunger, Poverty, and Nutrition Policy TUFTS UNIVERSITY (Boston, MA)	15,225	12,650	28,272	12,272	6,325	12,000	4,000	3,248	9,024	3,077
Center for Water and Wetlands Resources THE UNIVERSITY OF MISSISSIPPI (Oxford)	8,510	6,600	8,510	3,255	3,255	3,255	0	280	2,975	2,975
Ctr. for the Tech. Dev. of Natural Products THE UNIVERSITY OF MISSISSIPPI (Oxford) ⁵	19,500	19,500	26,355	26,355	23,439	NA	NA	23,439	2,918	0
Center for Plant Biodiversity MISSOURI BOTANICAL GARDEN (St. Louis)	16,000	TBD	16,000	8,000	8,000	8,000	0	0	6,000	8,000
Meet Science and Safety Center UNIVERSITY OF MISSOURI (Columbia)	3,500	4,856	5,146	2,428	2,428	2,718	0	2,428	0	0
Bioscience Research Laboratory MONTANA STATE UNIVERSITY (Bozeman)	16,000	16,000	16,000	8,000	8,000	2,700	5,300	5,382	2,808	2,808
Biochem. and Biology Field Research Station UNIVERSITY OF NEVADA (Reno)	930	825	930	715	715	215	0	715	0	0

FACILITY AND LOCATION	TOTAL COST OF FACILITY			COST SHARING				FUNDS APPROP. TO DATE		ADDTL. FED. FUNDS REQ.	
	As Originally Proposed	As Reported to Congress ¹	Current Inst. Est. Cost ²	Requested Federal Share		Non-Federal Share ³		Funds	Approp. to Date	According to Inst.	According to CSRS ⁴
				According to Inst.	According to CSRS ²	Cash	In Kind				
Center for Molecular Biology RUTGERS UNIVERSITY (New Brunswick, NJ)	84,600	84,600	84,600	37,200	37,200	47,400	0	10,789		28,411	28,411
Center for Aird Land Studies NEW MEXICO STATE UNIV. (Las Cruces)	20,000	19,112	22,600	11,000	9,656	11,900	0	788		10,202	8,758
Livestock/Herbarium NEW YORK BOTANICAL GARDEN (Bronx)	26,000	26,003	26,000	13,000	13,000	13,000	0	7,550		6,450	5,450
Ctr. for Rech. on Hum. Nutr./Chron. Dis. Prev. WAKE FOREST UNIV. (Winston-Salem, NC)	48,363	12,150	99,577	48,970	11,438	0	50,807	11,438		37,534	0
Animal Care Facility NORTH DAKOTA STATE UNIVERSITY (Fargo)	10,000	10,000	10,000	5,000	5,000	5,000	0	1,918		3,082	3,082
Inst. for Agr. Health Science and Rural Med. UNIV. OF NORTH DAKOTA (Grand Forks)	17,350	17,350	20,245	9,787	9,787	8,628	3,930	9,787		0	0
Lake Erie Soil/Water Rech./Education Ctr. UNIVERSITY OF TOLEDO (Toledo, OH)	5,000	0	5,600	2,800	283	2,800	0	283		2,537	0
Beef Cattle Research Facility OKLAHOMA STATE UNIVERSITY (Stillwater)	1,500	1,420	1,500	750	750	750	0	352		398	398
Regional Food Innovation Center OREGON STATE UNIVERSITY (Pacific NW)	13,000	10,620	10,620	4,900	4,900	5,720	0	2,503		2,397	2,397
Center for Food Marketing ST. JOSEPH'S UNIV. (Philadelphia, PA)	25,600	8,340	25,600	12,400	12,400	13,200	0	7,598		4,804	4,804
Coastal Institute on Narragansett Bay UNIVERSITY OF RHODE ISLAND (Kingston)	38,083	38,083	41,194	19,184	19,184	22,000	0	5,944		13,250	13,250
Hort. Public Svc. Rech./Education Ctr. MIDDLE TENN. ST. UNIV. (Murfreesboro)	574	600	603	287	287	316	0	287		0	0
Nursery Crops Research Station TENNESSEE STATE UNIVERSITY (McMinnville)	3,400	3,400	3,400	1,700	1,700	1,700	0	1,812		88	88
Agric. Biol. and Environ. Research Complex UNIVERSITY OF TENNESSEE (Knoxville)	38,500	38,500	38,500	19,250	19,250	19,250	0	3,390		15,860	15,860

FACILITY AND LOCATION	TOTAL COST OF FACILITY			COST SHARING				FUNDS APPROP. TO DATE		ADDTL. FED. FUNDS REQ.	
	As Originally Proposed	As Reported to Congress ¹	Current Int. Est. Cost ²	Requested Federal Share ³		Non-Federal Share ³		Funds	In Kind	According to Int.	According to CSRS ⁴
				According to Int.	According to CSRS ⁴	According to CSRS ⁴	Cash				
Center for Southern Crop Improvement	15,000	14,108	14,510	7,000	7,000	7,510	0	584		8,418	8,418
TEXAS A&M UNIVERSITY (College Station)											
Biotechnology Laboratory	7,034	7,034	7,113	2,884	2,884	3,822	327	2,477		387	387
UTAH STATE UNIVERSITY (Logan)											
Agricultural Biotechnology Facility	9,000	NR	8,885	4,550	4,550	4,315	0	4,550		0	0
VIRGINIA TECH (Blacksburg)											
Animal Disease Biotechnology Facility											
WASHINGTON STATE UNIVERSITY (Pullman)	49,802	48,800	52,082	23,400	23,400	28,682	0	10,387		13,013	13,013
Net. Resources Bldg. (Addition/Remodeling)											
UNIVERSITY OF WISCONSIN (Stevens Point)	10,800	9,650	10,857	4,825	4,825	6,032	0	2,064		2,781	2,781
Environmental Simulation Facility											
UNIVERSITY OF WYOMING (Laramie)	18,500	18,500	18,883	9,218	9,218	8,647	0	1,832		7,284	7,284
TOTALS	731,088	583,378	818,691	407,471	350,630	333,490	75,830	172,861		234,610	177,669

Notes:

NR — No report submitted to Congress or no amount reported to Congress
 TBD — To be determined through on site visit or final report to Congress
 NA — Not applicable

¹ Except where otherwise noted, figures in this column include only the amounts applicable to the mission of USDA as reported to Congress.

² Figures in this column represent current total cost of facilities, including changes due to the effects of inflation or university revisions to the scope of the project. In some cases, figures may be inflated by 3% due to CSRS overhead.

³ In accordance with House language, projects funded for the first time in fiscal year 1994 require a cash match. Where institutions have proposed a partial "in-kind" match, the non-Federal share has been adjusted to reflect the required cash match.

⁴ Figures may not include CSRS overhead of 3%. Amount to complete facility could be 3% higher than indicated.

⁵ Included in ARS Buildings and Facilities Account.

UNDISBURSED FUNDS

Mr. DURBIN. Please provide for the record a list of undisbursed funds, by project.

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE
Undisbursed Balances as of March 14, 1994
Buildings and Facilities Grants Awarded by CSRS
(In Dollars)

Building and Facility Project	Undisbursed Balance
ALABAMA	
School of Veterinary Medicine, Tuskegee University	\$145,954
ARIZONA	
Agriculture Research Complex-Environmental Stress Lab University of Arizona	787,000
ARKANSAS	
Center for Alternative Pest Control Research, U. of Arkansas ..	1,177,400
Agriculture Building.....	1,617,960
CALIFORNIA	
Alternative Pest Control Containment and Quarantine Facility, University of California, Davis	2,177,451
COLORADO	
Animal Reproduction and Biotechnology, Colorado State Univ. ...	310,400
DELAWARE	
Poultry Biocontainment Laboratory, Univ. of Delaware	319,130
FLORIDA	
Agricultural Biotechnology Institute, Univ. of Florida	352,088
GEORGIA	
Biocontainment Facility, University of Georgia	2,547,624
National Laboratory for Environmentally Sound Production Agriculture, University of Georgia	204,047
Center for Advanced Water Technology, Savannah State College ..	206,610
Vidalia Onion Storage Facility, University of Georgia	218,250
HAWAII	
Center for Applied Aquaculture Research and Training, Makapuu Point Campus, Oceanic Institute, Hawaii	2,023,420
Center for Tropical and Subtropical Agric., Univ. of Hawaii ...	1,087,370
IDAHO	
Biotechnology Facility, Idaho	1,382,250
ILLINOIS	
Biotechnology Center, Northwestern University	809,950
INDIANA	
Molecular & Cellular Biotechnology Facility, Indiana Univ.	1,746,000
KANSAS	
Plant Science Center, Kansas State University	1,164,000
LOUISIANA	
Red Meat Processing Facility, NW State University	68,870
MAINE	
Presque Isle Farm Building Consolidation, Univ. of Maine	145,500
MARYLAND	
Institute for Natural Resources and Environmental Science, University of Maryland	2,588,930
MASSACHUSETTS	
Center for Hunger, Poverty, and Nutrition Policy, Tufts University	2,135,940

Building and Facility Project	Undisbursed Balance
MISSISSIPPI	
Biological Technology Center for Water and Wetlands Resources, University of Mississippi	188,180
MISSOURI	
Bennett Living and Learning Center, Lincoln University	69,121
Meat Science and Safety Center, Univ. of Missouri	2,355,160
MONTANA	
Bioscience Research Laboratory, Montana State University	2,045,319
NEVADA	
Biochemistry and Biology Field Research Station, University of Nevada	485,000
NEW JERSEY	
Plant Bioscience Facility, Rutgers University	2,123,330
NEW MEXICO	
Center for Arid Land Studies, New Mexico State University	774,060
NEW YORK	
New York Botanical Garden	3,737,410
NORTH CAROLINA	
Bowman-Gray Center for Nutrition, Wake Forest University	2,981,780
NORTH DAKOTA	
Institute for Earth Systems Science, Univ. of North Dakota	107,340
Animal Care Facility, North Dakota State University	1,860,460
Institute/Agric. Health Science and Rural Medicine, University of North Dakota	630,500
Institute for Agriculture and Rural Health Research Development, Minot State University	2,113,630
OHIO	
Plant Science Research Facility, Univ. of Toledo	266,750
Lake Erie Soil and Water Research and Education Center, University of Toledo	255,110
OKLAHOMA	
National Veterinary Center for Equine and Bovine Biotechnology Research, Oklahoma State University	282,092
Beef Cattle Research Facility, Oklahoma State University	341,440
OREGON	
Seafood Center, Oregon State University	210,490
Regional Food Innovation Center, Oregon State University	2,427,910
PENNSYLVANIA	
Center for Food Marketing, St. Joseph's University	2,473,500
RHODE ISLAND	
Building Consolidation, University of Rhode Island	3,761,825
TENNESSEE	
Nursery Crop Research Station, Tennessee State University	553,870
Agricultural, Biological and Environmental Research Complex, University of Tennessee, Knoxville	2,515,210
Horticulture Public Service Research and Education Center, Middle Tennessee State University	278,390
TEXAS	
Southern Crop Improvement, Texas A&M University	566,480
UTAH	
Biotechnology Laboratory, Utah State University	751,750
VIRGINIA	
Agriculture Biotechnology Facility, Virginia Polytechnic Institute and State University	1,424,930

Building and Facility Project	Undisbursed Balance
WASHINGTON	
Center for Information and Technology Transfer, Gonzaga	
University, Spokane, Washington	444,942
College of Veterinary Medicine, Animal Disease Biotechnology	
Facility, Washington State University	4,830,377
WEST VIRGINIA	
Poultry Research Facility, West Virginia University	415,194
WISCONSIN	
College of Natural Resources, University of Wisconsin,	
Stephens Point	2,002,080
WYOMING	
Environmental Simulation Facility, University of Wyoming	1,448,970
Total	67,938,744

TUFTS UNIVERSITY

Mr. DURBIN. According to page 9-68 of the notes, there is a zoning issue that needs to be resolved before construction can proceed at Tufts University. What is this zoning issue and what is its status?

Dr. JORDAN. All technical matters regarding the zoning for the site and use of the facility have been resolved. Final zoning approval is expected from the Boston Redevelopment Authority in April 1994. Tufts University plans to proceed with the formal architectural and engineering phase for this facility during the spring of 1994 with construction scheduled to start on or about October 1, 1995.

MONTANA STATE UNIVERSITY

Mr. DURBIN. According to page 9-69 of the notes, construction is held up for the Bioscience Research Laboratory at Montana State University because of a lack of State matching funds. What is the problem and when do you anticipate this issue will be resolved?

Dr. JORDAN. The university is waiting until it receives the full Federal funding commitment before asking the Montana State Legislature for non-Federal matching funds. The university anticipates that it will be able to accomplish this by the fiscal year 1995 legislative session.

SAINT JOSEPH'S UNIVERSITY

Mr. DURBIN. According to page 9-71, there is a problem with the facility siting for the Center for Food Marketing at Saint Joseph's University. What is the problem and when do you anticipate this issue will be resolved?

Dr. JORDAN. St. Joseph's planners have completed a review of six sites and selected one for this facility. Preliminary engineering has been completed for this site. The City of Philadelphia Council and Zoning Commission have been notified of the choice and appraised of the engineering results. No future land use regulatory problems are anticipated. St. Joseph's plans to commence formal architectural and engineering phase for this facility on or about May 1, 1994 with construction scheduled to commence on or about June 1, 1995.

VIRGINIA TECH

Mr. DURBIN. According to page 9-73 of the notes, the Agricultural Biotechnology Facility at Virginia Tech in Blacksburg, Virginia, is being redesigned due to re-siting. What is involved in the re-siting; did it add to the cost; and to what extent has it delayed construction of the building?

Dr. JORDAN. The original concept for construction of the Agricultural Biotechnology Facility called for the building to be sited at the back edge of campus on Prices Fork Road. During early planning this was seen to be a problem. It would have been expensive to run utility hookups to the site and would have created communications problems for researchers after occupancy. It was therefore decided to resite the facility in the middle of campus. Because of limited space and the expense involved in such a move, the size of

the facility was scaled back to stay within budget. We estimate that the resiting may have caused a 12-month delay in construction. The university plans to begin construction this Spring.

AGRICULTURAL BIOTECHNOLOGY

Mr. DURBIN. Ms. DeLauro.

Ms. DELAURO. Thank you, Mr. Chairman, and good morning.

Dr. JORDAN. Good morning.

Ms. DELAURO. It's good to be here with you this morning. I noted in your testimony that you believe that biotechnology shows tremendous promise, and if I might take the liberty of quoting, it says, "The knowledge base available in support of agricultural biotechnology is nowhere near that available in support of medical biotechnology in the United States."

I applaud your concern and your efforts to promote agricultural biotechnology.

I will be parochial again in talking about my state of Connecticut. We have both the University of Connecticut in conjunction with the Storrs, Connecticut Agricultural Experiment Station, and the Connecticut Agricultural Experiment Station in New Haven. Both are pursuing agriculture biotech initiatives.

It's my understanding that they will be eligible for competitive grants to further their kind of work under your National Research Initiative. Is that correct?

Dr. JORDAN. That's absolutely correct.

Ms. DELAURO. Then let me ask you this. Is there any effort on your part to centralize or to coordinate this kind of research, to move in a regional direction, an overall national direction?

Dr. JORDAN. In terms of the issue of biotechnology research overall, the Department consistently prepares a cross-cut that shows how much is being invested by the Agricultural Research Service, the Forest Service, CSRS, etc., across the Department in that regard.

In terms of specific topic areas, we have a beautiful mechanism that lends itself extremely well to the biotechnology approach. It's called the Regional Research Program. It accounts for 25 percent of the Hatch funds, but it also brings in funds from a number of other sources.

And so what we do and encourage through that mechanism is for scientists to get together and plan together and execute together. Now, whether one person does one piece of it, and another person does another piece, or whether they use the same materials and transfer them one to the other, what we like to do is encourage the maximum to come out of any investment.

Ms. DELAURO. Is it your sense that regionalizing in some ways would be better able to manage the whole area of biotechnology?

Dr. JORDAN. We don't use regionalization on all areas, but we have a number of programs that regionalization does seem to be the very best approach. The Aquaculture Program is regionalized. The Sustainable Agricultural Research and Education Program is regionalized. The Integrated Pest Management Program is regionalized and so forth, and it is a mechanism that we use often.

Ms. DELAURO. Okay. Recently CSRS was really terrific in sending up a team to the University of Connecticut to evaluate a pro-

posal that would allow the University to concentrate its many, many talents—and I know you've been up there so you know what they do there—on promoting this kind of breakthrough in biotechnology.

Is that in keeping within the goals of CSRS on agriculture biotechnology research?

Dr. JORDAN. Well, I think it does, yes, ma'am. And in fact, when I speak of the regionalization, I'm reminded that the federal laboratories often in that region or elsewhere are very active participants in that.

AQUACULTURE RESEARCH

Ms. DELAURO. I want to follow-up a question you mentioned. I asked about aquaculture yesterday, and you referred to it a moment ago. You said in the testimony that aquaculture will likely be a major growth industry in the 21st century.

It clearly is my hope. I come from a district that borders the Long Island Sound and I want to tell you that more than 88 percent of the farmed oysters in the northeast come from the State of Connecticut, so it's an industry that I am very particularly concerned with.

I understand that there has been some research done on oyster cultivation at your Massachusetts facility, and I know that there are several initiatives that you have. Can you provide me with a detailed description of the research that's been done in this area on oyster cultivation as it pertains to estuaries such as Long Island Sound.

Dr. JORDAN. We would be very pleased to do that. There are, in the Northeast, several projects that focus in this particular arena, and we will provide you with some information.

[The information follows:]

OYSTER AND SCALLOP CULTIVATION IN THE NORTHEASTERN U.S.

I. Oyster and Scallop Aquaculture Projects Presently Sponsored by the U.S. Department of Agriculture

A. Projects Presently Supported by the Northeastern Regional Aquaculture Center:

1. **Project Title:** "Commercial Field Tests of MSX-Resistant Strains of the American Oyster (Crassostrea virginica)"

Total Funding: \$194,941

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:Universities and Research Institutions

Rutgers University (NJ)
University of Massachusetts at Amherst
Cornell University (NY)
University of Maryland (MD)

Private Sector

Mathis and Mathis (NJ)
William Barnish (NJ)
Mook SeaFarms, Inc. (ME)
Aquacultural Research Corporation
(MA)
Contuit Oyster Company (MA)
Yarmouth Oyster Farms (MA)
Stony Island Sea Farms (MA)
Wellfleet Oyster and Clam Company (MA)
Joel Fox (MA)
World's End Aquaculture Corporation (MD)
Intertidal Marine Aquaculture (VA)
F.M. Flower & Sons Oyster Company (NY)

Objectives:

- o To provide MSX-resistant strains to oyster growers to compare their survival, growth, market value and MSX incidence with local controls under commercial conditions.
- o To replicate these experiments in different parts of the region and under different growing conditions.

- o To disseminate these results throughout the aquaculture industry.
- 2. **Project Title:** "A Comprehensive Investigation of Larval Development and Mortality in the Eastern Oyster, Crassostrea virginica"

Total Funding: \$198,698

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:

University and Research Institutions

University of Maryland-Horn Point
Marine Biological Laboratory and
University of Pennsylvania
(MA and PA)
State University of New York at
Stony Brook
University of Massachusetts,
Cooperative Extension
Woods Hole Oceanographic Institute
(MA)

Private Sector

Aquacultural Research Corporation
(MA)

State and Federal Agencies

National Marine Fisheries Service
(CT)

Objectives:

- o To characterize the normal microscopic anatomy of Crassostrea virginica from fertilization through metamorphosis, to early juvenile.
- o To document normal larval development and feeding activity through metamorphosis with non-invasive, time lapse video technology.

- o To characterize physiological rate processes in normal and stressed organisms using both real-time and post-sampling techniques.
 - o To document changes in major catabolic energy substrates throughout development and under conditions of nutritional stress.
3. **Project Title:** "Unexplained Mortalities of Hatchery-Reared Oysters, Crassostrea virginica, in the Northeast: A Followup Study"

Total Funding: \$20,000

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:

University and Research Institutions

Rutgers University (NJ)
State University of New York, Stony Brook

Private Sector

Frank M. Flower & Son Oyster Company (NY)
Bluepoints Oyster Company (NY)

State and Federal Agencies

Virginia Institute of Marine Science

Objectives:

- o To determine whether the mortalities are associated with a particular broodstock or hatchery.
- o To determine whether the mortalities are associated with grow-out site.

- o To determine whether the mortalities can be stimulated by experimental temperature elevation.
- o To document the association of tissue and shell abnormalities with mortalities in the various experimental treatments.
- o To continue efforts to determine whether the mortalities are associated with a pathogen.

4. **Project Title:** "Creation of High Survival Resistant Lines of American Oyster Using MSX-Resistant Strains"

Total Funding: \$8,625

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:

Universities and Research Institutions
Rutgers University (NJ)

Objectives:

- o To create two new strains of resistant oysters, consisting of:
 - a) five founder populations derived from Delaware Bay MSX-resistant strains and
 - b) five founder populations from Long Island MSX-resistant strains.

5. **Project Title:** "The Role of Bacteria and Microalgae in Unexplained Juvenile Oyster Mortalities"

Total Funding: \$71,491

Period of Payment: January 1, 1993 -
October 31, 1993

Participating Organizations:Universities and Research Institutions

Rutgers University (NJ)
 State University of New York,
 Stony Brook

Private Sector

Frank M. Flower and Sons
 Oyster Company (NY)

State and Federal Agencies

Nantucket Marine Laboratory
 (MA)

Objectives:

- o Monitor survival, growth, and pathology of four cohorts of juvenile eastern oysters grown under commercial conditions.
- o Compare survival, growth, and pathology of a subsample of one cohort moved into larger mesh size as soon as size permits.
- o Compare survival, growth, and pathology of a subsample of one cohort maintained in the FMF Co. hatchery in various combinations of well salt water, 25 um-filtered bay water, and ambient water.
- o Sample water, sediment, and tray contents for the presence of Vibrio spp. at the FMF Co. nursery and at a site in Oyster Bay removed from the immediate vicinity of the intensive culture operations.
- o Perform challenge experiments with suspected pathogenic Vibrio ssp. collected at the nursery site.
- o Sample water in the vicinity of the FMF Co. nursery for presence and abundance of potentially noxious phytoplankton, particularly Gymnodinium sanguineum, and to isolate and produce unialgal, non-axenic cultures of this or other

bloom-forming, potentially noxious species.

- o Perform challenge experiments with suspected noxious microalgae, if candidate species are associated with juvenile Oyster Mortality and isolated from waters at the nursery site prior to or during a mortality episode.
- o Perform challenge experiments, at several temperature regimes, with potentially damaging chain and colony-forming microalgae collected on Nantucket Island, MA.

6. Project Title: "Possible Cytotoxic Effects of the Dinoflagellate, Gyrodinium aureolum on Juvenile Bivalve Molluscs"

Total Funding: \$2,849

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:

State and Federal Agencies

Department of Marine Resources (ME)
Marine Biological Laboratory (MA)

Objectives:

- o To ascertain the extent of any cellular damage to the gut tissue of commercially important, juvenile bivalve molluscs resulting from exposure to a toxic dinoflagellate, Gyrodinium aureolum.

7. Project Title: "A Proposal for the Study of a Protozoan Disease Agent(s) Associated with Mortalities of Hatchery-Reared Juvenile Oysters in the Northeastern United States"

Total Funding: \$10,000

Period of Project: January 1, 1993 -
October 31, 1993

Participating Organizations:State and Federal Agencies

USDC/NOAA/NMFS, NE Fisheries Science
Center (MD)

Objectives:

- o Continue pathological studies of juvenile oyster mortalities concentrating on epizootiology, pathology, and parasitology.
- o Continue identification of suspected protistan pathogen by use of electron microscopy to discern parasite specific ultra-structural characteristics.
- o Demonstrate etiological relationship with known features of the disease - age, size, conchiolin deposition.
- o Continue transmission studies to provide continuous source of infectious disease agent for future identification.
- o Study the role of salinity in the disease process to determine if salinity may be a barrier to the disease agent.
- o Explore potential therapeutic & prophylactic use of selected ciliate and bacterial medications to eliminate the disease.

B. Other USDA-Sponsored Projects

Chesapeake Bay Aquaculture Program, Maryland, funded by the Cooperative State Research Service.

One component of this research is to improve the culture of the American oyster through genetics, reproductive biology, nutrition, and health management. The nutritional biochemistry objectives include the determination of sterol and fatty acid composition of oysters related to diet. The fish health objectives include studies

to determine if dermo causes mitochondrial function and salinity tolerance differences in Chesapeake Bay and Atlantic oysters.

CSRS supports research on hatchery and nursery technology for oysters as well as research aimed at the genetic improvement of oysters. Research in this area has been supported through formula funds, the Regional Aquaculture Centers, the National Research Initiative, Special Research Grants and the SBIR program. Research on the East coast addresses the development of oyster strains that are resistant to diseases; improved understanding of the causes and etiology of oyster diseases; and improving survival of oyster larvae under hatchery rearing conditions. Technology for triploid oyster production has been developed and commercialized. Remote setting and off-bottom techniques have also been evaluated.

Research in the area of feeds for oysters, has been directed at fertilization of oyster ponds primarily through co-production with other species such as shrimp. This work has been supported through the U.S. Marine Shrimp Farming program and through a special research grant in Hawaii.

Participating Organizations:

Universities and Research Institutions

University of Maryland
University of Delaware
Rutgers University (NJ)

State and Federal Agencies

Woods Hole Oceanographic Institution
(MA)
National Marine Fisheries Service
(DC)

II. Other Agencies Supporting Oyster or Scallop Cultivation in the Northeast

Department of Commerce: National Sea Grant College Program (Contact: Dr. James McVey, Tel: 301-713-2451)

Department of Commerce: National Marine Fisheries
Service (Contact: Dr. Dean Parsons, Tel: 301-
713-2367)

Department of Commerce: National Marine Fisheries
Service Saltonstall-Kennedy Program
(Contact: Dr. Kenneth L. Beal. Tel: 508-281-
9267)

III. **Scallops**

- A. USDA does not presently sponsor any projects in direct support of scallop cultivation in the Northeast.
- B. A commercial bay scallop cultivation program has been initiated in Massachusetts by Taylor Ocean Industries, Inc. (Contact: Rodman E. Taylor, President, Taylor Seafood, Inc., P.O. Box D-810, New Bedford, Massachusetts 02742-0810. Tel: 508-993-3349); FAX 508-990-1730.
- C. In Connecticut, Mr. Tim Visel of the Bridgeport Regional Vocational Aquaculture Center has indicated interest in a bay scallop cultivation program. Tel: 203-576-7608.

IV. **Seagrass and Estuary Restoration Programs in the Northeast**

Researchers at a number of Northeast institutions have been involved in initiatives or research that could lead to the restoration of seagrass beds and estuarine habitats. An important consideration has been the relationship between healthy coastal environments and commercial shellfish production.

In addition, the State of Maryland is now seriously considering a major oyster cultivation program to accomplish the dual goals of restoring Maryland's decimated oyster populations and improving Chesapeake Bay's water quality through the natural filtering abilities of oysters. On December 1, 1993, an Maryland Oyster Roundtable consisting of aquaculturists, watermen, environmentalists, scientists, educators, state legislators and State agency representatives approved a comprehensive action plan for restoring oyster populations through aquaculture and improved management.

For additional information on these new programs, the following contacts are suggested:

Maryland

Dr. Tom Hopkins, President, Maryland
Aquaculture Association, Tel: 301-353-0363

Dr. Torey Brown, Secretary, Maryland
Department of Natural Resources,
Tel: 410-974-3987

University of Rhode Island

Dr. Scott Nixon, Tel: 401-792-6800

University of Connecticut - Stamford

Dr. Charles Yarish, Tel: 203-322-3466

Connecticut Department of Agriculture

Mr. John Volk, Tel: 203-874-0696

Other

Dr. Nelson Marshall, Professor
Emeritus, Graduate School of
Oceanography, University of
Rhode Island who now resides
in St. Michael's, Maryland.
Tel: 410-745-2126. (Dr. Marshall
is an expert on bay scallops
and estuarine ecology).

Dr. Kenneth Chew, School of
Fisheries, University of
Washington. Tel: 206-543-4290

Dr. Stan Allen, Rutgers University,
Tel: 609-785-0074

SCALLOP AQUACULTURE

Ms. DELAURO. I also understand that there are few, if any, initiatives ongoing for scallop aquaculture, again which is another interest of mine. I don't know if there has been any work done by your scientists on the connection between the growth of bay scallops and the decline of sea grass beds. Any of this kind of information would be particularly helpful to us.

Dr. JORDAN. The director of the Western Aquaculture Center, Dr. Kenneth Chu, is very much involved and has a long history in this arena. There is a shellfish consortium of scientists being organized to address some of this, so I think the future will see some specific plans coming forth, Congresswoman.

FORMULA FUNDS

Ms. DELAURO. Thank you. One final question. You are requesting level funding for the formula programs that support the agricultural experiment stations. At the same time, you've placed a premium on the work that these funds allow the experiment stations to do.

You said, and I quote again, "that they support research of the highest priority." At the two stations in my state, there is real concern. That's about keeping the highly-trained scientists that are there who do such good work. If there is just level funding, there is little room for them to have any opportunity to increase salaries, and allow them to keep the station going and to continue to doing the very fine and high quality work that gets done at the ag. experiment stations.

Will level funding compromise the ability of these agricultural experiment stations to continue doing their high-quality work and the important work that we expect them to do from your testimony?

Dr. JORDAN. In fiscal year 1994, you've provided some increase over fiscal year 1993, and that's been a boost, and I think that's all right for 1995. We are probably going to be all right, particularly if you put that boost in for the National Research Initiative because you have in the State of Connecticut and many other places, of course, some highly competitive scientists that can bring in the additional resources through that mechanism.

Ms. DELAURO. Thank you very much. Thank you, Mr. Chairman.

FTEs AND CONTRACT EMPLOYEES

Dr. DURBIN. Thank you, Ms. DeLauro. Dr. Jordan, let me ask you a question I've asked other agencies about contract employees. How many FTEs are you currently showing for CSRS, and what are your projections, and tell me a little bit about contract employees and similar projections?

Dr. JORDAN. Mr. Chairman, we have a staff ceiling at the moment of 235. In one sense, maybe I could put a little footnote behind that and say that number supports a 45,000 person program, and that's not bad for a general headquarters that outruns the National Science Foundation or the National Institutes of Health in terms of efficiencies, in that sense.

Nevertheless, we must take our share of the reductions in government which the citizens are asking for, and so we project between now and 1998, a reduction to 215 people in the full-time CSRS staff.

In terms of contract labor, Mr. Chairman, we have about \$11,000, in that of a clerical person; and the only reason that that becomes cost-effective is that it is cheaper to take part of a person to take on an overload, than it is to hire a full-time person when you don't need them full-time. We also have a contract for ADP support. In fiscal year 1993 we supported two FTEs and in fiscal year 1994 we have reduced that support to one FTE.

We do, Mr. Chairman, have shared faculty—that is to say, scientists in universities who work maybe 20 percent of their time for us. That allows us to get that breadth of expertise that we would need to carry out our program, and that accounts for only about 4.4 FTE's, so it is not a large part.

We would have to look at that. In fact, we have looked at it in terms of reducing the number of IPAs that have come in from the universities. We had ten in fiscal year 1993. We have four in the current year, and we project two for next year.

Mr. DURBIN. What is an IPA?

Dr. JORDAN. An IPA is an individual hired under the Intergovernmental Personnel Act. Which means that we simply swap personnel. We buy half the person's time, pay for their travel and their per diem costs while they are with us.

Mr. DURBIN. Thank you. Mr. Skeen.

Mr. SKEEN. Thank you, Mr. Chairman, and I apologize to you, Dr. Jordan, for not being here earlier. I have been doing a field study on the Case Bridge. [Laughter.]

Dr. JORDAN. And it is jammed up, sir?

Mr. SKEEN. Like it was yesterday, I think the same folks. I think they draw lots to see who is going to cross the bridge.

You mentioned that you are talking about reducing by 250 FTEs?

Dr. JORDAN. No, we are reducing from 235 to 215.

Mr. SKEEN. To 215.

Dr. JORDAN. Yes.

Mr. SKEEN. I see. How do you plan to separate these folks? Attrition or buy-outs, or what is the plan?

Dr. JORDAN. The number is probably soluble in terms of retirements. We will perhaps have some, if the buy-out becomes authorized, pick that route.

Mr. SKEEN. But you will let the employee make the decision.

Dr. JORDAN. Well, in a sense. There are certain critical areas, Mr. Skeen, where we simply have to hang on to folks or get another—for example, if our veterinarian decided that he wanted to leave, well, it has taken us five years to get one. I think we'd say no, sir, that one is probably ineligible.

Mr. SKEEN. The pressure goes both ways. Probably in those areas where you feel like you need to reduce personnel, you're going to have to offer some kind of incentive.

Dr. JORDAN. That's true.

Mr. SKEEN. Either go by attrition or by buy-outs or whatever.

Dr. JORDAN. Yes.

Mr. SKEEN. And the other way, the pressure is to keep them.

Dr. JORDAN. Yes.

Mr. SKEEN. I appreciate the sensitivity in the way you handle it.

CSRS-ARS COMPARISON

Mr. SKEEN. CSRS's budget stays flat, while the ARS received a \$17 million increase, and they proposed closing 19 labs. Yet, federal funds administered by CSRS serves as a catalyst, to leverage State and other non-Federal funds at a rate of 1 to 4. Maybe CSRS has to close buildings to get an increase. It seems that we get more bang for the buck in the CSRS funds. Would you comment on these relationships where you leverage money from the states and other sources?

Dr. JORDAN. Funds such as Hatch, McIntire-Stennis and Animal Health require the participating states to match the Federal funds, and our actual experience shows that Federal investments have returned at least a four fold increase in funds targeted for agricultural research. The states have responded by not only providing state funds but seeking grant and industry funds to highly leverage the initial Federal investment. The research results from the total funds invested by the State Partners is a very positive relationship for USDA.

Mr. SKEEN. Do you believe that by leveraging money from other participants we get a better product than if the federal government provided the entire funding?

Dr. JORDAN. The partnership between USDA and the 1862 and 1890 Land Grant Universities has a very productive history of making significant contributions to United States agriculture and the food delivery system. This system allows the creative talents of University scientists to address problems of a local, regional and national nature that when combined across the system has given an unquestionable benefit to the solution of national problems. In many situations the Agricultural Research Service, Forest Service and Economic Research Service scientists are members of the research team that makes the progress in seeking solution to agricultural problems. CSRS is very confident that an excellent product is obtained from the partnership research program through the Colleges of Agriculture, Agricultural Experiment Stations, Colleges of Veterinary Medicine, and Schools of Forestry and USDA's in-house research agencies.

Mr. SKEEN. In many cases CSRS is undertaking similar research as ARS. We have heard from a number of people, including Members of Congress, who are concerned that some of the ARS research being abandoned at these 19 ARS labs is not going to be continued anywhere else. Would you provide for the record whether or not you believe that CSRS could pick some of the slack in the research areas being abandoned?

Dr. JORDAN. In many states in which the ARS labs are located, the Land Grant University is conducting research on similar problems and in some cases the states have been cooperators in the research. The formula programs allow the states sufficient flexibility to reprogram funds to address research that is high priority to the State. Additionally, university researchers with applicable research projects are encouraged to apply for competitive grants.

PEER REVIEW

Mr. SKEEN. Last year we discussed the several different kinds of merit review. Some that go through organized panels, some that go through a decentralized merit review program which each State submits, and some you sent out by mail to selected people. Would you explain for the committee the concepts involved in peer reviews of agriculture-related research projects?

Dr. JORDAN. Peer review of agricultural research serves to provide the best possible scientific advice before expenditure of Federal funds and ensures that the most meritorious research will be supported. Projects are evaluated for their scientific merit and importance to agriculture and the American consumer. Peer review has been used for many years by many Federal agencies as a mechanism by which to make funding decisions.

Mr. SKEEN. I am specifically interested in knowing which projects regularly use peer reviews and which projects rely on other types of reviews?

Dr. JORDAN. All CSRS-supported projects undergo peer review. For some types of research support, such as proposals submitted to the National Research Initiative, peer review is conducted at the national level while for others, such as research supported by Hatch funds, peer review goes on at the local level. For some special research grants and the Sustainable Agriculture Research and Education Program—SARE—peer review is conducted regionally.

Mr. SKEEN. Are CSRS grants regularly put under the peer review process?

Dr. JORDAN. All CSRS grants are regularly put under a peer review process. For example, peer review of proposals submitted to the National Research Initiative—NRI—is coordinated by Program Directors, NRI staff scientists who are responsible for overseeing the review process and for providing assistance and advice to the Panel Managers. Panel Managers are scientists who are widely recognized by the scientific community for research contributions and who are currently engaged in research in a scientific discipline central to the Program's mission. Panel Managers are appointed, on a part-time basis, to a one year term. Panel Managers, in consultation with the Chief Scientist of the NRI and the Program Directors, are responsible for selection of panel members with the necessary scientific expertise, review experience, and breadth of knowledge. Several panel members review each proposal in depth and present their critical assessments in writing. Written reviews are also solicited from the scientific community on an *ad hoc* basis. Proposals are then reviewed, discussed and ranked in the panel meeting which is chaired by the Panel Manager. The Program recommendation for funding, based on the ranking and advice of the Panel, is then presented to the Chief Scientist who recommends the awards. Other CSRS grant programs use similar scientific merit review systems although the details of the process may differ.

Mr. SKEEN. Are the peer reviewers evaluating the importance of the research and its benefits to the agriculture producer as well as the American consumer?

Dr. JORDAN. Peer reviewers evaluate the scientific merit of the research and its benefit to the agriculture producer as well as the

American consumer. They also evaluate the relevance of the research to identified research priorities such as the National Research Purposes, the CSRS/ESCOP national strategic plan and the research priorities identified by the Joint Council and the User's Advisory Board.

Mr. SKEEN. Are CSRS buildings and facilities put to the same kind of scrutiny?

Dr. JORDAN. CSRS buildings and facilities, although not competitively awarded, also receive peer review. A panel of scientific experts make a site visit to the institution to evaluate the feasibility and necessity of the project prior to the expenditure of any Federal funds.

NATIONAL RESEARCH INITIATIVE (NRI)

Mr. SKEEN. The FY-95 budget request for NRI is \$130 million, an increase of \$24.58 million over FY-94. The six research components of the NRI are the environment, nutrition, plants, animals, markets, and value added. Which of the six research components in the NRI are receiving increases?

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE—NATIONAL RESEARCH INITIATIVE

[In thousands of dollars]

Category	Fiscal year—		Change	Fiscal year 1995 budget estimate
	1994 appropria- tion act	1994 revised ap- propriation act		
Natural resources and the environment	23,750	22,325	+4,675	27,000
Nutrition, food safety, and health	8,000	7,520	+3,480	11,000
Plants	43,900	41,266	+5,734	47,000
Animals	25,000	23,500	+6,000	29,500
Processing for adding value or developing new prod- ucts	7,500	7,050	+1,950	9,000
Markets, trade, and rural development	4,000	3,760	+2,740	6,500
Total	112,150	105,421	+24,579	130,000

NATIONAL RESEARCH INITIATIVE (NRI)

Mr. SKEEN. You also mentioned that all public universities, research organizations, Federal agencies, private organizations or corporations, and individuals are eligible to compete for these funds. Would you comment on which groups are more successful than the others, and why?

Dr. JORDAN. The National Research Initiative Competitive Grants Program—NRICGP—uses scientific merit, qualifications of the personnel and adequacy of facilities, and relevance to agriculture as evaluation factors when reviewing proposals. Type of institution is not considered as an evaluation factor. In addition, there is no formula for pre-determining support for the various types of performing organizations.

I will provide a chart for the record which shows for 1993 the success rates that apply.

[The information follows:]

Performing organizations	1992 Number of proposals submitted and [success rate (%)]	1993 Number of proposals submitted and [success rate (%)]
1862 Land-Grant (includes State Experiment Stations)	2035 [27.9]	1947 [29.1]
1890 Land-Grant	7 [8.1]	44 [6.8]
Private Non-Profit	88 [21.6]	82 [24.4]
Private Profit	13 [15.4]	13 [15.4]
Private Colleges and Universities	122 [37.7]	130 [33.1]
Public Colleges and Universities	314 [25.8]	342 [25.4]
Federal Laboratories	167 [21.0]	189 [20.6]
Vet Schools and Vet Colleges	103 [17.5]	115 [18.3]
Others (Individual Postdoctoral Applicants, etc.)	32 [15.6]	31 [22.5]

As apparent from the above table, success rates ranged from 6.8 percent to 37.7 percent. Success is determined by the evaluation of the individual proposal by a panel of peers. Individuals with more experience at preparing proposals for competitive peer review, such as those individuals at private colleges and at 1862 Land-Grant Universities, may be more successful in this type of competition. The NRICGP has had as one part of its mission, to attract talented scientists from outside the traditional agricultural research community—Land-Grant Institutions and USDA Federal Laboratories—into agriculture. The success rates of the private and public colleges and universities is demonstration that this goal has been partially achieved. The NRICGP also is working to improve the success rate of individuals at less successful institutions. By initiating its Strengthening Program, NRICGP has been able to provide funding to individuals at small and mid-sized institutions and institutions in states that have an average funding level from the NRICGP no higher than the 38th percentile.

Mr. SKEEN. Would you comment on how another Federal agency would compete for these funds, and could you give an example?

Dr. JORDAN. Individuals at Federal agencies compete for NRICGP funds in the same panels with individuals from other types of institutions using identical peer review procedures. For example, scientists from the USDA Forest Service prepare proposals, submit at designated deadlines, and the proposals are reviewed exactly as other proposals submitted to the same program.

Mr. SKEEN. Would you comment on the success of the Experimental Program to Stimulate Competitive Research—EPSCoR—program?

Dr. JORDAN. The NRICGP EPSCoR-like program has been highly successful. The program supports individuals at colleges and universities within states that have an average NRICGP funding level no higher than the 38th percentile. The total amount of funds going to each of these states has dramatically increased since the initiation of the Strengthening Program in 1992. I will provide a table which shows the specific details regarding this fact.

[The information follows:]

TOTAL NRICGP AWARD TO USDA EPSCoR STATES

State	Fiscal year 1991	Fiscal year 1993	X-fold increase
AK	0	\$149,895	.....
AR	\$79,000	1,012,676	12.8
CT	66,000	1,514,862	23.0
DE	452,000	650,490	1.4
HI	180,000	439,378	2.4
ID	624,593	971,559	1.6
ME	234,500	388,940	1.7
MS	281,000	700,746	2.5
MT	601,000	727,509	1.2
NH	170,000	1,351,011	7.9
NH	185,900	557,459	3.0
NM	82,000	404,013	4.9
RI	242,960	484,318	2.0
SC	463,217	851,301	1.8
SD	156,854	529,453	3.4
VT	383,000	618,070	1.6
WV	313,634	910,502	2.9

TOTAL NRICGP AWARD TO USDA EPSCoR STATES—Continued

State	Fiscal year 1991	Fiscal year 1993	X-fold in- crease
WY	688,100	579,429	0.8

The NRICGP has worked actively with other agencies to coordinate efforts in EPSCoR. The Director of the National Science Foundation provided a letter to USDA Secretary Espy in which he expressed that the USDA EPSCoR program fulfills the spirit, intent and purpose of the NSF EPSCoR program

Mr. SKEEN. What constitutes a small or medium sized institution in EPSCoR?

Dr. JORDAN. The Food, Agriculture, Conservation, and Trade Act of 1990 included amendments to authorizing legislation for the National Research Initiative authorizing grants to faculty of small and mid-sized institutions. Within the National Research Initiative Strengthening Program a small and medium sized institution is defined as an academic institution with total enrollment of 15,000 or less. The goal of our EPSCoR-like program is a requirement contained in the annual Appropriations Act to improve the grant competitiveness of certain states that have not been successful in obtaining Federal competitive grants. Certain states have been designated as USDA-EPSCoR states for purposes of our strengthening grants program. Within these states however, institutions may compete regardless of size.

REDUCTION OF PESTICIDES

Mr. SKEEN. We have heard from ARS, ERS, NASS, the Secretary and now CSRS is making the reduction of risk from the use of pesticides a top priority. This is in addition to the efforts by EPA and FDA to reduce pesticides. Is this level of concentration appropriate, or are we making a bigger deal about the dangers of pesticides than is actually the case?

Dr. JORDAN. It is our belief that our level of commitment is appropriate for several reasons, not the least being the public concern regarding pesticides. We are developing meaningful pest management alternatives for our growers which include a greater understanding of pest biology and vulnerability, and the judicious use of pesticides in a holistic pest control program.

The scientific expertise in our system of experiment stations has pioneered many new and exciting tools and strategies to manage pests in Integrated Pest Management—IPM—systems. These systems utilize the natural controls that help keep pests in check, the predators, parasites, pathogens, and antagonists of pests. Another vital natural control is the genetic tolerance of our crops and livestock for the pests and their effects. We have national germplasm collections that provide a diversity of germplasm to breeders providing the basis for new agronomic types and varieties. We are seeing the benefits from using pheromones of pests to confuse mating or attract them to poisons or to monitor their occurrence. Crop rotations or slight adjustments in farming practices have proven to control or greatly lessen the losses from pests. These new technologies and new uses of existing technologies can move our farmers out of the debate over pesticide risks and on toward more permanent and sustainable solutions to pest problems.

Mr. SKEEN. The case of DDT, comes to mind. It helped to prevent millions of deaths, control yellow fever, plague, and other illness.

Yet, EPA made a political decision to ban its use when someone said it was killing birds. I know its not your responsibility to make the determination of the risk of these pesticides, but are you helping EPA to make better decisions based on science not emotions?

Dr. JORDAN. We must deliver pest control in Integrated Pest Management Systems that provide for judicious use and integration of various pest control tactics including lower risk pesticides in the context of the associated environment of the pest in ways that complement and facilitate biological and other natural controls of pests to meet economic, public health, and environmental goals. We believe this strategy will preserve the useful life of pesticides.

Congress has mandated that the Department provide to EPA its assessment of proposed pesticide regulations. The USDA's National Agricultural Pesticide Impact Assessment Program mission is to manage and coordinate USDA and our state university cooperators activities in the development of information, analysis of pesticide use, and documentation of the impacts related to registered pesticides used in U.S. agriculture. Since the program was established in 1976, many scientists from the states and the Federal government have participated in assessment team activities quantifying the benefits of pesticides important to agriculture and defining the impact to consumers should they no longer be available for use by farmers. Assessment team reports are transmitted to EPA for use in regulatory decisions affecting specific pesticides and crops. In many cases, assessment reports and accompanying research have resulted in a reduction in the risk of the proposed regulated pesticide. Reduction of risks have been achieved by protective clothing, timing of pesticide applications, reducing rates of pesticides and other novel approaches. The USDA's National Agricultural Pesticide Impact Assessment Program has been highly successful in providing useful information and research results to EPA that have resulted in a lower risk of our current pesticide usage.

LAND GRANT UNIVERSITIES

Mr. SKEEN. Would you agree that our system of research at land-grant universities, cooperatively supported by both state governments and the federal government, has been an important factor in the global competitiveness of the United States?

Dr. JORDAN. Yes. The land-grant research system is an important source of new knowledge that is making a major contribution to this nation's competitiveness in global markets for food, agriculture, and Forest products. The land-grant universities are developing and disseminating to businessmen and policy makers a wealth of knowledge about export markets. This includes knowledge of the preferences and tastes of foreign nationals, development of new commodities and value-added products to satisfy buyers in selected export markets, development of information on the organization and barriers to entry of these markets, means of overcoming these barriers and how to sell in them, analyses of the implications of the various trade negotiations completed this past year, and sending teams to the countries of the former Soviet Union and other countries to learn about and develop markets for U.S. products. These efforts are helping expand markets for U.S. made products and support the economies of rural America.

Mr. SKEEN. Do you feel it is important to maintain the federal role in this research partnership as we level the "playing field" of international trade through initiatives such as the North American Free Trade Agreement?

Dr. JORDAN. Sustaining this federal-state relationship is very important if the United States expects to level the "playing field" and remain competitive in global markets in the future. The trade advantage will reside with those countries who can excel in development of basic and applied research knowledge and be the first to successfully transfer this knowledge to their food, agriculture, and forest product production and processing sectors. The land-grant system with adequate federal support will continue to be a primary source of the knowledge and the technology transfer activities to sustain the growth in agricultural, food, and forest products.

Mr. SKEEN. Do you feel agriculture research at our land-grant universities has a role to play in maintaining environmental quality particularly in our arid states bordering Mexico?

Dr. JORDAN. Yes. A number of our land-grant universities have and are continuing to make substantial investments in hiring faculty and building research facilities for the purpose of enhancing environmental quality to support a sustainable agricultural system. Several of these programs are located in the Southwest. These programs are and will make substantive research contributions towards alleviating environmental problems found along our southern border.

Mr. SKEEN. Do you feel research and educational facilities for agricultural programs at our land-grant universities are adequate to meet the agricultural and environmental challenge of the next few decades that could threaten our global competitiveness and threaten the quality of our environment?

Dr. JORDAN. We recognize the importance of adequate facilities to the ability of land-grant institutions to perform cutting edge research. We are aware of a 1992 National Science Foundation study on university facilities that shows that the agricultural sciences have consistently accounted for lower shares of total construction and renovation/repair spending than for other sciences. However, this does not necessarily indicate that the existing set of facilities is inadequate. We do note that the land-grant institutions continue to perform outstanding research, and we are not aware of cases where grant applications have not been submitted due to a lack of facilities.

FAIR '95

Mr. SKEEN. I understand that USDA assisted in the planning and funding of a research priority process for animal agriculture, called FAIR '95. What is CSRS position on the results of that process?

Dr. JORDAN. CSRS contributed to FAIR '95 in several ways including participation in planning the overall program for the symposium and the post symposium summarization and review, along with providing funding support. A broad consensus building process was used to develop priorities during the symposium which involved university and Federal scientists, commodity/industry representatives and other benefactors of animal research. The docu-

ments communicating the outcomes of the symposium reflect the various participants in the process. The Agency is committed to supporting the important goals and objectives that resulted from this consensus effort and strongly advocates a comprehensive strategy for developing support for the priorities. We encourage each of the groups that have a key role in animal agriculture to address the issues and priorities that evolved from FAIR '95. It is also crucial that the FAIR '95 priorities continue to be reviewed on an ongoing basis and revised when appropriate.

Mr. SKEEN. Do you agree that the FAIR '95 priorities accurately reflect the research needs of animal agriculture?

Dr. JORDAN. The FAIR '95 priorities were developed through the use of abroad consensus building process involving university and Federal scientists, commodity/industry representatives and other benefactors of animal research and reflect the various participants in the process. The FAIR '95 goals and objectives are consistent with, but not totally inclusive of, the priorities developed by the Forum For Animal Agriculture, the State Agricultural Experiment Stations—SAES—/CSRS Strategic Research Agenda for the Land-Grant University System, and various commodity groups and other Federal agencies.

Mr. SKEEN. How do current CSRS research programs fit the FAIR '95 priorities?

Dr. JORDAN. The current research programs reflect decisions made by scientists and administrators prior to when the FAIR '95 research priorities were established in 1992. Despite this, an analysis conducted by CSRS in 1993 of all CSRS-sponsored and cooperating agricultural research programs within the university system, indicates that a significant amount of the current research effort is being directed toward the goals and objectives identified in FAIR '95. The FAIR '95 priorities for food animal research were used extensively during the development of the SAES/CSRS Strategic Research Agenda for the Land-Grant University System. Consequently, all research priorities regarding animal agriculture resulting from that process appear to be fully compatible with the FAIR '95 research priorities. Research decisions being made by scientists and administrators now and into the foreseeable future will likely reflect an increased proportion of funding toward FAIR '95 priority areas. The Cooperative State Research Service is using the FAIR '95 priorities for several purposes including input for Regional Research funding, the National Research Initiative, and budget development.

Mr. SKEEN. To what extent will CSRS use the FAIR '95 priorities in preparation of its request for proposals the National Research Initiatives competitive grants program?

Dr. JORDAN. The National Research Initiative program has benefited from the advisement of scientists from USDA agencies, university scientists, and animal industry representatives through symposia, workshops and customer conferences. As a result, several programs have been modified, expanded or initiated. The FAIR '95 goals and objectives have been and will continue to be valuable input to those discussions.

Mr. SKEEN. I appreciate the work that you folks do. It has been great working with you.

Dr. JORDAN. Thank you, sir.

Mr. SKEEN. Thank you, sir.

Dr. DURBIN. Mr. Pastor has some questions he would like answered for the record.

[The questions and responses follow:]

ALTERNATIVE CROPS

Mr. PASTOR. The CSRS FY 95 budget request did not include funding for a number of projects. I see in the explanatory notes you have retained the FY 94 funding level of \$1,818,000 for Supplemental and Alternative Crops but have not included any amount for the specific research initiatives outlined in last year's appropriations legislation. What level of funding and what degree of priority are you anticipating giving to the hesperaloe research effort?

Response. USDA participation on the President's National Science and Technology Council includes CSRS involvement with the advanced manufacturing initiative through development of advanced materials from renewable resources. That initiative for fiscal year 1995 calls from an intense program of development for industrial products and processes using vegetable oils. Although hesperaloe could provide the inputs for advanced materials, it was not included explicitly in the Administration's fiscal year 1995 budget. In fiscal year 1994 Congress directed \$150,000 for hesperaloe, mainly for agronomic research.

INTERNATIONAL ARID LANDS CONSORTIUM

Mr. PASTOR. Similarly, your budget has not included funding for the international arid lands consortium, a project long advocated by Vice-President Al Gore. Are you anticipating providing funding for this effort through an alternative source?

Response. Due to the discretionary nature of the Hatch Act and related formula based programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility could provide for funding research work under the international arid lands consortium if the State institutions wish to continue this research. Projects could also be submitted for competition and possible funding under the National Research Initiative.

RESEARCH INITIATIVES

Mr. PASTOR. Would you provide a detailed description of the type of research initiatives that you think will be of greatest benefit to the country? For example, do you think we should be emphasizing research on alternative crops over research on ways to improve more traditional ones? If not, what other priorities do you consider more advantageous or what type of balance between new and traditional crop research would you advocate?

Response. Most research issues, especially basic research issues, can apply to both alternative crops as well as traditional crops. There are many opportunities for new products and exports in the new crops arena. At the same time, we must pursue research for our major crops and fine ways to reduce pesticide use and increase competitiveness. Current initiatives such as integrated pest management, sustainability, and competitiveness are high priorities and many of these issues are being and can continue to be addressed through the National Research Initiative Competitive Grants Program, as well as other research programs.

Mr. DURBIN. Mrs. Vucanovich and Mr. Walsh also have some questions they would like answered for the record.

[The questions and responses follow:]

SPECIAL RESEARCH GRANTS

Ms. VUCANOVICH. I am concerned about the proposal to reduce funding for what you describe as "low priority" grants under the Cooperative State Research Service. Many of these grants are very important to specific states and the needs of our country. Please explain what is considered a low priority grant? Will such work be completed in another fashion under the reorganization proposal?

Response. From our standpoint, low priority grants include those projects that focus on concerns of a narrow local area or sector and which have not been evaluated through a rigorous competitive award process. We continue to support Hatch Act and other formula funds to provide states with resources which can be directed to identified state, regional, and local needs. The Secretary's reorganization proposal

for research, education, and economics programs would combine research and extension program planning and coordination functions. In so doing, we believe that the process of priority setting will be improved so that limited resources can be devoted to the highest national priorities.

RANGELAND RESEARCH

Ms. VUCANOVICH. You mentioned rangeland research in your statement. Where is this research being completed, and please go into more detail about this research.

Response. In the past five years, six to eight grants have been awarded per year to universities and federal agencies in Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, Oregon, South Dakota, Texas, and Utah.

Rangelands are complex ecosystems that serve a multitude of beneficial uses—whether they are used to graze livestock, as principal watersheds or as wildlife habitat and feedstock. There are pressing problems to be addressed to ensure that these important lands are efficiently managed for the welfare of the nation. The research being conducted in this program addresses the establishment of beneficial plants on the rangeland and the management of those lands. Noxious weeds are a major problem. They are intrusive, persisting, and of limited value. The researchers are examining several means to rid or reduce these undesirable plants and replace them with desirable species. One completed project examined the allelopathy—the chemical means of competition among some plants. Phytotoxic chemicals—phenolics—are produced by some plants that retard growth of the weed. Understanding of this mechanism is the subject of continued research. A method to ensure that livestock do not consume toxic plants is to train them to avoid such plants. Continuing work has shown that ewes train lambs to avoid some plants, that grazing sheep and cattle together can be beneficial to the health of the range, and that cattle can be trained to avoid as food such things as pine needles that can cause abortions in cows.

The objective of one continuing study is the training of sheep to specific diets. Lambs are introduced to a variety of plants not normally selected by free-ranging animals. The study has determined that the trained lambs will feed on those selected plants; and when they become ewes, they will train their offspring to do the same. The implications for range management are significant. The study has been continued with a goal of training animals to graze in areas other than the riparian grasslands.

Another completed study has examined the uncertainty concerning cattle prices and forage yields by using statistical techniques to maximize net ranch income. This study devises strategies regarding cow-calf and stocker operations to be considered by the rancher.

Also, the effect of mycorrhizal fungi on selected rangeland grasses was determined. Grasses inoculated with these beneficial fungi competed more successfully with noxious plants than did the untreated controls. Treated plants also maintained better water efficiency. Results indicate restoration of disturbed with mycorrhizal treated plants will provide better establishment in grasses that can successfully compete with weeds.

Shrubs are a major component of the range vegetation. A completed study has identified candidates for revegetation of severely eroded and degraded range which are tenacious and which provide winter feed for wildlife and livestock.

Basic studies into the insect-plant interactions have isolated insects which may provide control of noxious weeds that have invaded rangelands. While such studies are continuing, the researchers are optimistic that insects may be used in place of herbicides, thus reducing costs to the rancher and increasing the desirable species of grasses used by animals. Additional work into the allelopathy exhibited by competing plants has identified the precursor of the active ingredient that retards and restricts the growth of a gregarious weed found throughout the western range.

An economic study found production/marketing strategies based on assumptions of high prices and high forage—good weather—are typically too high risk to be in most rancher's risk efficient set of strategies but develops a net income of \$6,000 per year for the test ranch. Few ranchers can or will place themselves in this high-risk situation; for, if neither high selling price nor excellent weather occur, the results could be economic disaster. Traditional management practice for a cow-calf operation with March calving and October selling and grazing all available acreage would develop a net income of \$454. An ecological study of range succession showed that adventive weeds dominate through high fecundity and germination rather than by superior photosynthetic characteristics or shading of competitors. In another study, variations in shrub seedling frost and drought tolerance are probably not as important as germination timing in the establishment strategy. Germination of

range shrub seeds is dependent on continuous chill as a part of range establishment. These latter two studies are important in developing management of ranges and the re-establishment of beneficial species for forage of livestock and wildlife.

Results of completed research have led to continual improvement of the resource base. The discovery of a gene that enhances the drought resistance in four wing saltbrush will lead to engineering this important shrub for introduction into droughty sites. Research into the leafy spurge, a noxious invasive weed, was reported. Control may be achieved by training livestock to selectively forage it. Other research examined the biotic control by defining DNA in various subspecies of this weed and then determining the effectiveness of specific insects to the subspecies. Riparian studies defined the relationships between grazing practices and streambank erosion and rehabilitation management practices for the riparian areas. Grazing management determines the condition of the range. Research into grazing summer and winter range has helped determine best management practices for regions of the range. The research into ecosystems continues to determine succession patterns and the management of critical range areas.

WATER CONSERVATION PROJECTS

Ms. VUCANOVICH. Currently, water conservation projects are being completed through the special grant program of CSRS. Will these programs continue under the reorganization and what priority is given to water conservation? As you know, this is a very large problem for western states.

Response. Water conservation is a part of many programs in USDA. In CSRS, in addition to the special grants program, at least five of the Regional Research Committees have a major focus on water conservation.

Water conservation can be expected to be a part of future research programs; however, the title of the program could change. The 1995 CSRS budget request includes funding for the Water Quality Special Research Grants Program, which includes water conservation research. Water conservation research can also be carried out through the Hatch Act and the National Research Initiative.

BUILDING AND FACILITIES.

Ms. VUCANOVICH. The budget does not request funding for the Buildings and Facilities account under CSRS. How will this affect projects currently funded by that program?

Response. Under the Building and Facilities Program, grantees are required to provide at least 50 percent matching funds. If federal funds are not provided, grantees will need to fully fund the remaining portion of the project.

PESTICIDE USAGE

Mr. WALSH. In New York State we grow a number of varieties of fruits and vegetables that rely heavily on pesticide usage. As reregistering these pesticides is often economically unfeasible, many of these minor use crops will not be able to be produced if pesticides are taken off the market. What research is being done to reduce this overreliance on pesticides? What Northeastern crops rely most heavily on extensive pesticide use and what Integrated Pest Management (IPM) techniques are being used in the region?

Response. The potential and real loss of pesticide labels for crops grown in the Northeast has caused Northeastern states and New York to increase efforts to foster and sponsor research on integrated pest management—IPM—methods. Many of these methods are alternatives to pesticides. For example, New York is currently sponsoring research on biological control and host resistance to overcome the attack of insects, weeds, and plant pathogens. Projects on biological control include red mites which attack apples, leafhoppers which attack grapes, plant pathogens which attack potatoes, root-feeding weevils which attack alfalfa, root rots which attack raspberries, and biological control and host resistance for several insects which attack cabbage are six research projects currently being sponsored by CSRS in New York at a total of \$530,000. These funds come from the USDA-CSRS Special Research Grants—Public Law 89-106—Integrated Pest Management and Biological Control budget line. Similar projects are being sponsored in many of the other Northeastern states. In addition, research is being sponsored on alternatives such as cultural methods like tilling, mulching, mechanical weed removal, and crop rotations to combat pest problems.

In the Northeast growers of fruit, vegetable, greenhouse and nursery crops rely most heavily upon pesticides to prevent crop loss. Many of these growers are now beginning to adopt alternatives to pesticides as the result of IPM demonstration

projects sponsored by Smith-Lever IPM funds from USDA-Extension Service. Growers in this region have reduced their reliance upon pesticides by as much as 50 percent in some crop settings. However, the continued availability of pesticides to protect these crops remains a high priority. The efforts of the Pesticide Clearance—IR-4—program, also supported under USDA-CSRS Special Research Grants—Public Law 89-106—addresses the reregistration of pesticides for these priority minor uses. The fiscal year 1995 budget proposes increases over fiscal year 1994 of \$4.5 million for the Pesticide Clearance program and \$3.96 million for Integrated Pest Management/Biological Control.

HUMAN NUTRITION

Mr. WALSH. Yesterday, we talked with officials at ARS about their work in human nutrition programs and, in particular, their research at Baylor College of Medicine with regard to reducing infant mortality and preventing low-birthweight infants through nutritional advances. What work does CSRS do in this area? What role does calcium play in improving the health of these infants?

Response. CSRA sponsors several human nutrition scientists who research the nutritional needs of normal and low-birthweight infants. The emphasis of the formula, special and competitive grant programs is research on micronutrient nutrition using human infants and laboratory animal models, thus complementing the ARS Center's activities. University researchers funded by CSRA have demonstrated that marginal vitamin B-6, zinc or polyunsaturated fatty acid status compromises neural and immune functions. Other laboratories are assessing the factors that affect the bioavailability of zinc, iron, selenium, calcium, biotin, folate, and vitamin K in human milk and infant formula. Research on preterm infants suggests that their calcium stores are compromised, and their extraordinary bone growth exacerbates their calcium requirement. More investigations are needed to specify the role that dietary calcium plays in improving infant growth and conceivably their health. The National Research Initiative supports research on the relationships of human health to diet and nutrition and human nutrition and genetics, including specific nutrient and gene interactions. In fiscal year 1995 an increase of \$3.48 million is proposed for Nutrition, Food Safety and Health.

REORGANIZATION

Mr. WALSH. How does the reorganization affect your agency?

Response. Under the Department's proposed reorganization, the four agencies currently under the Assistant Secretary for Science and Education, including Cooperative State Research Service CSRS, will be merged into the new Agricultural Research and Education Service—ARES. CSRS currently has responsibility for the administration of Federal research and education programs to our university partners. Under ARES, program planning and coordination functions will be combined as a means of improving the program development and priority setting process. In addition, there will be an organizational entity for Federal, State, Industrial Partnership Programs which will encompass all the programs jointly planned and executed with University partners in research, extension, and higher education. The overall administration for the Federal base funds that support programs at the Land-Grant Universities are part of this unit's responsibility. Included are the current CSRS competitive, special and facility grants, and formula funds administration for support of research and higher education.

Mr. DURBIN. Thanks, Dr. Jordan, and thanks very much for your testimony this morning. We will be back in touch with you.

Dr. JORDAN. Thank you.

COOPERATIVE STATE RESEARCH SERVICE

Statement of Dr. John Patrick Jordan, Administrator of the Cooperative State Research Service (CSRS) before the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies.

Mr. Chairman and Members of the Subcommittee: American agriculture is the envy of the world. As our nation's biggest industry, it is the most efficient agriculture in the world and remains a mainstay source of food and fiber for this country and much of the world. A major contributor to this success is the agriculture and forestry research carried out in the land-grant college system for well over a century. This remarkable idea created a Federal-State partnership in science and education to serve all the people and this system has done just that.

Through joint planning with the public and private sectors as well as scientific review of projects and programs, the Cooperative State Research Service focuses Federal resources on perennial and emerging problems in agriculture, related to the provisions of the Farm Bill and the priorities of the Joint Council on Food and Agricultural Sciences and the National Agricultural Research and Extension Users Advisory Board. CSRS programs span the continuum from fundamental research in the National Research Initiative to mission-focused work in our formula based and special grants programs to commercialization in our supplemental and alternative crops and Small

Business Innovation Research programs. It is all targeted to priority needs of producers and consumers of food and fiber. The partnership between USDA and the university based research and education system is forged through CSRS. We cooperate with the 59 State and Territorial Agricultural Experiment Stations; the 17 1890 land-grant institutions, including Tuskegee University; the 63 Forestry Schools; and the 27 Colleges of Veterinary Medicine in the United States. In addition to land-grant universities, there are other universities, not of the land-grant model, which are participants in the system. Together these institutions very effectively address regional and national needs in agricultural research and education as well as their particular State and local agendas.

The mission of CSRS is to advance science, technology and education in support of agriculture, forestry, people and communities through a partnership with the system of State Agricultural Experiment Stations, colleges, universities, and other public and private research and education organizations and in concert with the Secretary of Agriculture and intent of Congress. CSRS accomplishes its mission of advancing science, technology, and education with a current personnel ceiling of 235 staff-years. These 235 staff-years support a system of approximately 45,000 people.

CSRS operates under several legislative authorities which enable it to flexibly address agricultural research and education needs. These programs bring about inter-state cooperation and Federal-State collaboration in planning and carrying out a national program of agricultural research and education. The CSRS/State system performs approximately 68 percent of all

publicly funded agricultural and forestry research in this country. Federal funds administered by CSRS serve as a catalyst, and leverage State and other non-Federal funds at a rate of 1 to 4. As a result of the Federal funds, the State partners bring their non-Federal funds to the planning table for a coordinated national program of agricultural research. The effect of Federal funds is therefore far greater than would be expected solely on the basis of the amount of funds provided. Now let me give you a brief overview of our 1995 budget request.

FORMULA BASED PROGRAMS

The State-Federal partnership in food and agricultural research and education has benefitted both American consumers and the agriculture industry and merits continued strong support. The Hatch, McIntire-Stennis Cooperative Forestry, Animal Health and Disease, and Evans-Allen formula based programs are the foundation of the partnership. Funding from other Federal programs, including special and competitive research grants, funds from the States, and funds from private industry build on this foundation.

These four core programs support the basic laboratory facilities, scientists, and graduate students necessary to tackle the perennial and recurring problems in agriculture and assure the long-term stability of agricultural research. In 1994 they comprise about \$226 million or 51 percent of the \$444 million CSRS research and education budget. These programs allow the institutions maximum flexibility to support research of the highest priority and at the same time assure the strong working relationship between the USDA and the State Agricultural Experiment Station system. For 1995, it is proposed that funding for these four programs remain at the 1994

appropriated level. We are very pleased that, for the first time, the President's Budget requests funding for the Animal Health and Disease program.

NATIONAL INITIATIVE FOR RESEARCH ON AGRICULTURE, FOOD AND ENVIRONMENT

In fiscal year 1991, a major new program was implemented by the Department of Agriculture -- the National Initiative for Research on Agriculture, Food and Environment (NRI). The NRI has been broadly endorsed by users of research results and brings new Federal support for agricultural research awarded on a competitive basis. In 1993, almost 2,900 proposals were submitted requesting about \$576 million and we were able to support approximately 16 percent of the funds requested. During the past three years we provided to this Committee a monthly report summarizing the research objectives of each of the grants as they were awarded. A quarterly report also was provided outlining the accomplishments of completed competitive grants. We will continue to provide these reports to the Committee.

I want to stress that the NRI is truly a Departmentwide research initiative that happens to be located in CSRS. The responsibility for the policy and planning of the NRI lies with the Assistant Secretary of Science and Education who chairs the Board of Directors which takes into consideration the advice of the diverse individuals and groups interested in agricultural research. The Board is composed of the Administrators of the Cooperative State Research Service,

Agricultural Research Service, and Extension Service; the Director of the National Agricultural Library; the Chief Scientist of the NRI; the Forest Service Associate Chief for Research; and the Administrator of the Economic Research Service.

The 1995 budget request of \$130 million is an increase of \$24.58 million over 1994. The six research components in the NRI and their 1995 budget requests are as follows: \$27 million for natural resources and the environment; \$11 million for nutrition, food safety and health; \$47 million for plants including funds for the plant genome mapping program with the Agricultural Research Service as the lead agency; \$29.5 million for animals; \$6.5 million for markets, trade and rural development; and \$9 million for processing for adding value or developing new products. The NRI components have significant impact on the Department's programs on water quality, global change, biofuels, food safety, biotechnology, biological control of pests and diseases, human nutrition, new uses and products, sustainable agriculture, and advanced manufacturing.

Biotechnology is the latest in technology available to improve our crops and livestock for greater resistance to pests and diseases, tolerance to environmental stresses, and to make their products better suited to consumers both domestically and within world markets. Biotechnology is also widely accepted within the scientific community, however, the knowledge base available in support of agriculture biotechnology is nowhere near that available in support of medical biotechnology in the U.S. Moving forward with biotechnology applied in agriculture and appropriately integrated with more traditional technologies depends greatly on a solid base of

fundamental knowledge. The NRI is a critical program of the Department's effort to provide this knowledge base for agriculture.

The key to the NRI is its balanced approach focusing on priority issues using both fundamental science and mission-linked research. It is from this balanced approach that major conceptual breakthroughs emerge. Fundamental research projects are both individual investigator grants and multidisciplinary team research grants, as well as institutional strengthening grants.

Funds are awarded through a competitive, science-based merit review process. This mechanism is well suited to stimulating new research activity in specific, high-priority areas of science and engineering. All public and private universities, research organizations, Federal agencies, private organizations or corporations, and individuals are eligible to compete for these funds. With increased growth in the NRI, USDA competitive research grants can be made more comparable in size and length to grants awarded by other Federal agencies.

The NRI has embarked on a mission to strengthen agricultural research at small and midsized institutions and institutions in States that have traditionally received less support from the competitive grants program--defined as USDA-EPSCoR (Experimental Program to Stimulate Competitive Research) States. A further goal is to encourage talented young scientists to pursue careers in agricultural research. To address these goals, in 1993, the NRI provided \$17.1 million in seed grants, equipment grants, new investigator grants, career enhancement awards, post doctoral grants and regular grant awards to 209 awardees.

The NRI is strongly supported by the Administration and has received Congressional support since its inception. It has the support of numerous producer, consumer, and trade associations. It has attracted the interest of the scientific community throughout the United States. The NRI is of critical importance to the future of American agriculture.

SPECIAL RESEARCH GRANTS AND OTHER GRANT PROGRAMS

The CSRS Special Research Grants program, which is an important element in funding research, concentrates on problems of national and broad regional interest beyond the scope and resources of the formula based programs. In 1995, \$29.7 million is requested to address essential national issues such as integrated pest management/biological control, minor use animal drugs, the National Biological Impact Assessment program, pesticide clearance, pesticide impact assessment, water quality, rural development centers and global change.

The Sustainable Agriculture Research and Education or SARE program supports research and education projects that provide results directly useful on commercial farms and ranches and enhances the future economic viability of U. S. agriculture. Special emphasis is placed on whole-farm and ranch systems research and economic impact assessment. The 1995 request of \$8.8 million is an increase of \$1.4 million over 1994. SARE is managed through four regional administrative councils composed of farmers and ranchers, and representatives of non-profit private, agribusiness, government and academic organizations. Most funded projects have meaningful involvement of farmers or ranchers. Sustainable agriculture farming practices enhance environmental quality and the natural resource base upon which the agriculture economy depends

and make the most efficient use of non-renewable resources and integrate, where appropriate, natural biological cycles and controls.

The Administration has made the reduction of risk from the use of pesticides a top priority.

USDA, EPA, and FDA are involved in a joint initiative to reduce pesticide use risks by emphasizing integrated pest management and sustainable agricultural practices. The SARE program along with many of the special grants proposed as well as the NRI support this effort.

The \$4.0 million Aquaculture Regional Centers program supports five centers in the United States for research, development, demonstration, and education to enhance viable and profitable U. S. aquaculture which would benefit consumers, producers, service industries, and the American economy. With steadily increasing per capita consumption of seafood and a limited supply of wild stock, aquaculture will likely be a major growth industry in the 21st century. The Centers program focuses on priority R&D needs expressed by industry for improving aquaculture technology and market potential.

The 1995 request of \$1.8 million under the CSRS Supplemental and Alternative Crops program will support research and development on advanced materials, which involves an intense program for uses of vegetable oils that provide materials of strategic and industrial importance.

The competitively awarded Rangeland Research program of \$475,000 supports research on management, revegetation, and rehabilitation of rangelands.

HIGHER EDUCATION

Recognizing that education is the lever that can move this nation successfully into the 21st century, CSRS supports a soundly integrated portfolio of higher education programs which advance USDA's role in promoting excellence in education. Our programs complement and build upon one another and are heartily endorsed by the Office of Science and Technology Policy.

The \$3.5 million National Needs Graduate Fellowships Program recruits and trains doctoral students in targeted shortage areas such as biotechnology, bioprocessing/engineering, food science/human nutrition, marketing, and water science. Grants are awarded competitively to institutions identified through the science-based review process as offering excellent teaching and research programs in the targeted areas. This program was initiated in 1984 and has attracted more than 700 superior new graduate students from a broad array of academic backgrounds into high priority disciplines. Evidence shows that without the fellowships program, most of these students would not be pursuing graduate study today in a food or agricultural discipline. We would likely have lost them to other areas of science and business.

The Institution Challenge Grants Program is designed to energize the educational system which is primarily responsible for training food and agricultural scientists and professionals. It stimulates the private sector to match, dollar for dollar, the Federal partner in providing support to strengthen the infrastructure of the U. S. food and agricultural sciences higher education system.

This \$1.5 million program fosters partnership ventures among universities, industry, and government. Areas of partnership initiatives include curricula revitalization, faculty development, innovative instruction delivery systems, and student experiential learning opportunities.

The 1890 Institution Capacity Building Grants Program serves as the crux of the Department's initiative to advance the teaching and research capacity of the 1890 Institutions and Tuskegee University. This \$10.55 million competitively awarded program strongly encourages matching funds from non-Federal sources and requires the institutions to cooperate with one or more USDA agencies in developing a proposal and in carrying out the capacity building project. This program is promoting partnership efforts with other institutions of higher education and private industry. The program is designed to encourage expanded linkages with 1890 Institutions as performers of research and developers of scientific and professional talent for the food and agricultural system.

In 1994, CSRS is implementing the new Higher Education Multicultural Scholars Program which provides support for the recruitment and four years of education for approximately 40 minority undergraduate students. The program will increase the ethnic and cultural diversity of the food and agricultural scientific and professional work force and advance the educational achievement of minority Americans. Stipends for scholars will cover 75 percent of the students' cost of attendance including tuition, fees, room and board, books and other educational expenses. The remaining 25 percent will be paid by the college or university. The 1995 budget request for this program is \$1.0 million.

The Morrill-Nelson program supports higher education in the food and agricultural sciences at land-grant institutions through a permanent appropriation of \$50,000 per year to each State and Territory for a total program of \$2.85 million. Many 1890 institutions benefit from these funds along with the 1862 land-grant institutions.

The investment we are making in these programs is having a tremendous impact on agriculture all across the Nation in terms of attracting outstanding young scholars, particularly women and minorities, broadening and updating the competencies of our faculties, and improving the overall quality of our curricula.

BUILDINGS AND FACILITIES

In 1994, \$53.9 million was appropriated to CSRS for Buildings and Facilities at designated institutions. This program provides for the acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities to carry out agricultural research, extension, and teaching programs in the States. No funding is being requested in 1995.

CSRS AND UNIVERSITY SUPPORTED RESEARCH

Many of the impacts of agricultural research over the past decade have been at the nexus of problems across program areas and at the boundaries of disciplines. The multifaceted approaches

to mission-focused research at the nation's universities have led to important advances in agriculture. CSRS supported scientists have successfully addressed many key issues, including several identified here.

Recent natural disasters underscore the value of good quality water and the need to protect the Nation's fresh water supplies. Agriculture is committed to the goal of protecting the Nation's waters from contamination by agricultural chemicals and waste products applied to agricultural lands. University-based scientists, with support from several CSRS programs, have contributed toward excellent progress in cleaning up our Nation's waters where point sources of pollution are involved. The challenge now is to prevent pollution from non-point sources which are diverse and involve complex processes. The Special Research Grants Water Quality Program, underpinned by fundamental ecosystem research supported through the National Research Initiative, and by long-term soil, water, and plant studies conducted with support of formula based programs, is addressing the non-point pollution challenge through research projects in every state. These involve partners in universities, state agencies, other federal agencies and private organizations. The research effort is reducing the load of agricultural chemicals in our surface and groundwater. Production systems are being implemented that are friendly to the environment while maintaining profitability to the farmer.

University and experiment station scientists have continued research efforts aimed at continued assurance of the safety of the food supply. One research accomplishment from the university community has been the development of a monoclonal antibody that can be used in a rapid test to

detect the organism that causes the foodborne illness of listeriosis. Researchers at another university developed a method to detect pathogenic heat-injured, but not killed, *Listeria monocytogenes* in pasteurized milk that has attracted interest from several pharmaceutical and food companies. University and experiment station researchers have also developed a solid-phase immunobead method kit for practical analysis of toxins associated with ciguatera poisoning in fish. Other university researchers have determined the effectiveness of irradiation, using an electron-beam accelerator, in destroying known pathogenic bacteria in beef and pork. Scientists are identifying and developing applications and production techniques for bacteriocins, natural bacteriocidal proteins produced by bacteria that are effective in inhibiting or controlling the growth of other spoilage or food poisoning bacteria in foods. Rapid and inexpensive immunoassay methods for pesticides in foods have been developed. Food safety research in universities and experiment stations addresses not only state and regional issues but national concerns about food safety as well.

In the animal health area, diarrhea of newborn animals causes annual losses in excess of \$100 million. In order to produce intestinal disease such as diarrhea in animals, the organism (virus, bacteria or parasite) requires a mechanism to attach to the cell membrane and gain entry to the intestinal cell. University researchers focusing on this problem have identified a genetically regulated receptor which is necessary for *Escherichia coli* (*E. coli*) to attach to the enterocyte. Other investigators have identified a specific molecule on the cell membrane which is required for binding and entry of porcine rotavirus and production of diarrhea in pigs. These findings are expected to permit genetic alteration of pigs so that they do not carry the receptor required for

attachment of *E. coli* and to lead to the development of feed additives which will block the receptor for the rotavirus agent. In both cases the emphasis would be on prevention of the disease rather than treatment of the animal after the disease has begun, leading to reduced use of antibiotics and reduced residue problems in food. These projects have been supported by funding from formula based programs including Hatch Act and Animal Health and Disease - Section 1433 funds for initial or pilot studies with larger amounts of support being received from the National Research Initiative Competitive Grants program.

Another area of coordinated work is integrated pest management and IPM in citrus is a good example of how the many challenges of various pests have been addressed with good result. Citrus is a crop of Asian origin. By bringing it to this country, we not only enjoy the many citrus fruits, but the crop can be grown without the many diseases and insects that are associated with it in its native lands. Unfortunately, some of its pests also have been inadvertently introduced over the decades. Biological control agents were used over a century ago to control the cottony cushion scale. Since then biological control also has been achieved for the California red scale, the brown soft scale, the woolly whitefly, the citrus whitefly, the citrus blackfly, and other insect pests. Recently, a fungus disease of the citrus mite that likely will replace conventional pesticides has been discovered and commercialized. Effective biological control agents have been shared among the network of SAES scientists between California, south Texas, and Florida. Alternatives to conventional pesticides are important to the viability of the citrus industry because it is grown

in areas that are very sensitive to ground water contamination limiting the use of pesticides. The IPM area is an excellent example of interagency cooperation among CSRS and the university system, ARS, ES, FS, and APHIS.

Sustainable agriculture spans all of the traditional agricultural fields and quality of life. It depends, increasingly, on a conversion from a resource-based to a knowledge-based agriculture. Under the Sustainable Agriculture Research and Education (SARE) program, emphasis is on whole-farm and ranch systems and their interaction with natural habitat, living organisms and soil, water, and air resources. Farmers and ranchers work in partnership with public sector researchers and representatives of non-profit private organizations, agribusiness, and government to achieve results that may be directly adopted and used in commercial operations and planning. Design, implementation, and evaluation of SARE projects are invested in the participants who are the users of the results. More than 250 SARE projects have been supported since 1988 in field crops, animal agriculture, and resource and waste management. Most SARE projects have educational components to assist with adoption of innovative and integrated systems. Under the National Research Initiative Competitive Grants program, the emphasis is on expanding the knowledge base needed to develop sustainable agricultural practices. In 1993, for example, a total of \$10.1 million in grants was awarded by the NRI for research on understanding and improving the management of nitrogen in soil, biological pest suppression, and other work directly relevant to sustainable agriculture. In 1994, the NRI will award grants in a new program on systems research consistent with sustainable agriculture.

University-based agricultural research has a long history of success in improving U.S., and indeed global, food and fiber production. This success is derived from the facts that universities encompass the broad range of expertise necessary to solve complex problems, link research to education and application, and have the flexibility to attack problems on multiple fronts.

Universities--working separately or in concert with one another, in focused disciplinary or multidisciplinary projects, in fundamental or applied research--can and do solve problems. The Cooperative State Research Service is committed to capitalizing on the capacity of America's universities by using the wide range of research support mechanisms Congress has granted us to serve agricultural producers and consumers and to assure environmental quality and our natural resource base.

Finally, we have published a report reviewing the dynamics of the CSRS base program as well as the Strategic Plan of the SAES System for the next four years. These publications are in your bags.

Mr. Chairman, that concludes my prepared remarks. I will be pleased to answer any questions.

COOPERATIVE STATE RESEARCH SERVICE

Purpose Statement

Cooperative State Research Service is the U.S. Department of Agriculture's principal entree to the university system of the United States for the purpose of conducting agricultural research and education programs as authorized by the Hatch Act of 1887, as amended (7 U.S.C. 361a-361i); the Cooperative Forestry Research Act of 1962, as amended (16 U.S.C. 582a-7); Public Law 89-106, Section (2), as amended (7 U.S.C. 450i); and the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3101 et seq.). Through these authorities, the U.S. Department of Agriculture participates with State and other sources of funding to encourage and assist the State institutions in the conduct of agricultural research and education through the State Agricultural Experiment Stations of the 50 States and the territories; by approved Schools of Forestry; the 1890 Land-Grant Institutions and Tuskegee University; Colleges of Veterinary Medicine; and other eligible institutions.

Cooperative State Research Service participates in a nationwide system of agricultural research and education program planning and coordination among the State institutions, U.S. Department of Agriculture and the agricultural industry of America. Program coordination and planning are carried out by a Cooperative State Research Service staff located entirely in the Washington, D.C. area. This headquarters unit serves more than 12,000 scientists in the university system of the United States. As of September 30, 1993, there were 214 full-time employees and 17 other than full-time employees.

Under the proposed reorganization, this agency will be merged into the newly established Agricultural Research and Education Service.

COOPERATIVE STATE RESEARCH SERVICE

Available Funds and Staff-Years

1993 Actual and Estimated, 1994 and 1995

Item	1993		1994		1995	
	Actual		Estimated		Estimated	
	Amount	Staff: Years	Amount	Staff: Years	Amount	Staff: Years
Direct Appropriations:						
Cooperative State Research Service ...	432,993,000	206	456,586,000	216	421,398,000	226
Buildings and Facilities	52,101,000	10	56,874,000	10	- -	- -
Total, Direct Appropriations	485,094,000	216	513,460,000	226	421,398,000	226
Obligations under other USDA						
appropriations:						
Alternative Agricultural Research and Commercialization Center:						
Administrative Support.....	122,084	- -	58,389	- -	58,389	- -
Biobased Prods. Exec. Summary.....	5,000	- -	- -	- -	- -	- -
Biobased Prods. Expo '94.....	10,000	- -	- -	- -	- -	- -
Technology 2000.....	1,000	- -	- -	- -	- -	- -
Agricultural Research Service:						
Evaluation Studies	177,000	- -	177,000	- -	177,000	- -
Biotech. Risk Assessment.....	905,900	- -	941,400	- -	953,700	- -
Water Quality Project.....	5,000	- -	- -	- -	- -	- -
Biobased Prods. Exec. Summary.....	5,000	- -	- -	- -	- -	- -
Biobased Prods. Expo '94.....	3,000	- -	- -	- -	- -	- -
Research Apprenticeship Program.....	250,000	- -	250,000	- -	250,000	- -
Agricultural Stabilization and Conservation Service:						
Demonstration & Instr. Farm Project..	55,080	- -	54,540	- -	54,540	- -
Animal and Plant Health Inspection Service:						
Leafy Spurge Control.....	55,000	- -	55,000	- -	55,000	- -
Bioeconomic Models for Leafy Spurge..	48,600	- -	48,600	- -	48,600	- -
Office of Agricultural Biotechnology:						
Biocontrol of Sweet Potato Whitefly..	21,463	- -	- -	- -	- -	- -
Extension Service:						
Rural Development Centers.....	2,064	- -	- -	- -	- -	- -
Biobased Prods. Expo '94.....	5,000	- -	- -	- -	- -	- -
Federal Grain Inspection Service:						
Research Science Program.....	9,720	- -	- -	- -	- -	- -
Food Safety and Inspection Service:						
Veterinary Products Info. System ...	40,000	- -	40,000	- -	40,000	- -
Office of Agricultural Biotechnology:						
Beef Study.....	23,000	- -	- -	- -	- -	- -
E. Coli Study.....	108,000	- -	- -	- -	- -	- -
Forest Service:						
E. Coli Study.....	40,000	- -	- -	- -	- -	- -
Biotech. Risk Assessment.....	62,000	- -	85,000	- -	85,000	- -
Forestry Research.....	1,600	- -	- -	- -	- -	- -
Atmospheric Deposition.....	137,996	- -	132,625	- -	132,625	- -
Biobased Prods. Expo '94.....	5,000	- -	- -	- -	- -	- -

Item	1993		1994		1995	
	Actual		Estimated		Estimated	
	Amount	Staff: :Years:	Amount	Staff: :Years:	Amount	Staff: :Years:
National Agricultural Library:						
Information Services	2,075	- -	2,075	- -	2,075	- -
Office of International Cooperation						
and Development:						
Boll Weevil Conference.....	3,500	- -	- -	- -	- -	- -
Soil Conservation Service:						
Weed Control Strategies.....	- -	- -	29,700	- -	- -	- -
Various agencies sharing cost of						
USDA Small Business Innovation						
Research Program (SBIR)	970,919	- -	968,992	- -	1,307,934	- -
Various research agencies sharing						
cost of Current Research Information:						
System (CRIS)	761,200	9	772,100	9	772,100	9
Various research agencies sharing						
cost of Minority On-Line Information:						
System.....	31,300	- -	- -	- -	- -	- -
Other Anticipated Reimbursements.....	- -	- -	287,245	- -	334,203	- -
Total, Other USDA Appropriations....	3,892,501	9	3,902,666	9	4,271,166	9
Total Agriculture Appropriations....	488,986,501	225	517,362,666	235	425,669,166	235
Other Federal Funds:						
Army Corps of Engineers:						
Computerized Environmental Resources:	174,761	- -	76,983	- -	76,983	- -
Regional Recreation Demand Models....	100,000	- -	54,054	- -	54,054	- -
Waterway Network Research.....	148,203	- -	- -	- -	- -	- -
Ecological Functions of Wetlands....	106,788	- -	- -	- -	- -	- -
Functional Level of Created Marshes..	49,560	- -	- -	- -	- -	- -
Outdoor Recreation Opportunities....	38,837	- -	38,837	- -	38,837	- -
Demand and Marketing Study.....	32,400	- -	32,400	- -	32,400	- -
Central Intelligence Agency:						
Plant Breeders Conference.....	- -	- -	20,000	- -	- -	- -
Department of Commerce, NOAA,						
Atmospheric Deposition.....	200,260	- -	189,395	- -	189,395	- -
Department of Defense:						
Biodegradable Plastics Research.....	1,504,000	- -	486,500	- -	- -	- -
Alternative Deployment Pilot Proj....	943,000	- -	5,000,000	- -	5,000,000	- -
Non-Food Agric. Based Prod. & Tech..	4,700,000	- -	2,500,000	- -	2,500,000	- -
Department of Interior:						
Bureau of Land Management,						
Atmospheric Deposition	63,000	- -	63,000	- -	63,000	- -
Incentive-Based Grazing Fee.....	229,905	- -	- -	- -	- -	- -
Geological Survey, Atmospheric						
Deposition	482,518	- -	484,610	- -	484,610	- -
National Park Service, Atmospheric						
Deposition	124,225	- -	138,675	- -	138,675	- -

Item	: 1993		: 1994		: 1995	
	: Actual		: Estimated		: Estimated	
	: Amount	: Staff:	: Amount	: Staff:	: Amount	: Staff
		: Years:		: Years:		: Years
Environmental Protection Agency:	:	:	:	:	:	:
Atmospheric Deposition	53,640	--	54,700	--	54,700	--
Nitrogen Testing for Water Quality...	30,000	--	--	--	--	--
Agric. Conserv. & Environ. Center...	5,000	--	--	--	--	--
Agric. in Concert with Environment...	947,000	--	600,000	--	600,000	--
Sewage Sludge on Land.....	800,000	--	--	--	--	--
Research Conference.....	--	--	50,000	--	--	--
Food and Drug Administration:	:	:	:	:	:	:
Veterinary Products Info. System ...	54,000	--	54,000	--	54,000	--
INAD Coordinator.....	4,000	--	2,000	--	--	--
General Accounting Office:	:	:	:	:	:	:
Wheat Marketing Export.....	25,920	--	--	--	--	--
Naval Medical Research Institute:	:	:	:	:	:	:
Enteric Diseases Program.....	5,400	--	--	--	--	--
Office of Science & Technology Policy:	:	:	:	:	:	:
Scientific Services.....	45,245	--	--	--	--	--
Tennessee Valley Authority:	:	:	:	:	:	:
Atmospheric Deposition	22,192	--	27,180	--	27,180	--
U.S. Air Force:	:	:	:	:	:	:
SBIR Program.....	10,000	--	125,000	--	115,000	--
Other Anticipated Reimbursements.....	--	--	2,100,000	--	2,300,000	--
Total, Other Federal Funds.....	10,899,854	--	12,097,334	--	11,728,834	--
Total, Cooperative State Research	:	:	:	:	:	:
Service.....	499,886,355	: 225	529,460,000	: 235	437,398,000	: 235

COOPERATIVE STATE RESEARCH SERVICE

Permanent Positions by Grade and Staff-Year Summary

1993 and Estimated 1994 and 1995

	: 1993	: :	1994	: :	1995 (1)
Grade	: Headquarters	: :	Headquarters	: :	Headquarters
ES-6	: 1	: :	1	: :	1
ES-5	: 2	: :	2	: :	2
ES-4	: 3	: :	4	: :	4
	: :	: :		: :	
Senior Level	: 2	: :	2	: :	2
	: :	: :		: :	
GS/GM-15	: 38	: :	39	: :	39
GS/GM-14	: 18	: :	18	: :	17
GS/GM-13	: 15	: :	15	: :	16
GS-12	: 24	: :	24	: :	24
GS-11	: 12	: :	13	: :	13
GS-10	: 3	: :	3	: :	3
GS-9	: 18	: :	18	: :	18
GS-8	: 3	: :	3	: :	3
GS-7	: 26	: :	27	: :	27
GS-6	: 32	: :	33	: :	33
GS-5	: 15	: :	15	: :	15
GS-4	: 7	: :	7	: :	7
GS-3	: 2	: :	2	: :	2
	: :	: :		: :	
Total Permanent Positions	: 221	: :	226	: :	226
	: :	: :		: :	
Unfilled Positions: end-of-year	: -15	: :	-5	: :	-5
	: :	: :		: :	
Total, Permanent Employment, end-of-year	: 206	: :	221	: :	221
	: :	: :		: :	
Staff-Years: Ceiling	: 225	: :	235	: :	235

(1) Number of positions and grade levels are distributed on a pro-rata basis to meet the goals of the ARES realignment.

COOPERATIVE STATE RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1993 and Estimated 1994 and 1995

	1993	1994	1995
Personnel Compensation:			
Headquarters	\$8,790,470	\$9,574,000	\$9,807,000
Field	- -	- -	- -
11 Total Personnel Compensation.....	8,790,470	9,574,000	9,807,000
12 Personnel Benefits	1,712,887	1,868,000	1,913,000
13 Benefits for former personnel	0	0	0
Total Pers. Comp. & Benefits .	10,503,357	11,442,000	11,720,000
Other Objects:			
21 Travel	1,300,051	1,405,000	1,044,000
22 Transportation of things	50,856	51,000	39,000
23.3 Communications, utilities & miscellaneous charges	1,071,195	1,292,000	1,003,000
24 Printing and reproduction	456,217	492,000	386,000
25.1 Consulting.....	186,650	215,000	237,000
25.2 Other services	1,139,523	1,227,440	39,289
25.3 Purchases/Goods & Svcs .	2,487,064	2,543,000	346,000
25.4 Operation of GOCO's	0	0	0
25.5 Res. & Dev. Contracts ...	0	0	0
26 Supplies and materials ...	259,144	259,000	213,000
31 Equipment	306,040	306,000	247,000
41 Grants, subsidies and contributions	475,754,422	502,779,041	406,123,711
Total other objects.....	483,011,162	510,569,481	409,678,000
Total direct obligations	493,514,519	522,011,481	421,398,000
	=====	=====	=====

Position Data:

Average Salary, ES positions	\$110,200	\$114,430	\$116,261
Average Salary, SL positions	\$96,132	\$100,198	\$101,801
Average Salary, GM/GS positions	\$43,162	\$44,486	\$45,198
Average Grade, GM/GS positions	10.03	10.02	10.02

COOPERATIVE STATE RESEARCH SERVICE

The estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets):

Cooperative State Research Service:

- For payments to agricultural experiment stations, for cooperative forestry and other research, for facilities, and for other expenses, including \$171,304,000 to carry into effect the provisions of the Hatch Act approved March 2, 1887, as amended, including administration by the United States Department of Agriculture, penalty mail costs of agricultural experiment stations under section 6 of the Hatch Act of 1887, as amended, and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); \$20,809,000 for grants for cooperative forestry research under the Act approved October 10, 1962 (16 U.S.C. 582a-582-a7), as amended, including administrative expenses, and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); \$28,157,000 for payments to the 1890 land-grant colleges, including Tuskegee University, for research under section 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3222), as amended, including administration by the United States Department of Agriculture, and penalty mail costs of the 1890 land-grant colleges, including Tuskegee University; [\$72,917,000]
- 1 \$29,718,000 for [contracts and] special grants for agricultural research under section 2(c) of the Act of August 4, 1965, as amended (7 U.S.C. 450i(f);)(c)), including administrative expenses; [\$112,150,000]
\$130,000,000 for competitive research grants under section 2(b) of the Act of August 4, 1965, as amended (7 U.S.C. 450i(b)), including administrative expenses; \$5,551,000 for the support of animal health and disease programs authorized by section 1433 of Public Law 95-113, including administrative expenses; \$1,818,000 for supplemental and alternative crops and products as authorized by the National Agricultural Research, Extension, and Teaching
 - 2 Policy Act of 1977, as amended (7 U.S.C. 3319d); [\$500,000 for grants for research pursuant to the Critical Agricultural Materials Act of 1984 (7 U.S.C. 178) and section 1472 of the Food and Agriculture Act of 1977, as amended (7 U.S.C. 3318), to remain available until expended;] \$475,000 for rangeland research grants as authorized by subtitle M of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended; \$3,500,000 for higher education graduate fellowships grants under section 1417(b)(6) of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3152(b)(6)), including
 - 3 administrative expenses, to remain available until expended (7 U.S.C. 2209b); \$1,500,000 for higher education challenge grants under section 1417(b)(1) of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3152(b)(1)), including administrative expenses; \$1,000,000 for a higher education minority scholars program under section 1417(b)(5) of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3152(b)(5)), including administrative expenses, to remain available until
 - 4 expended (7 U.S.C. 2209b); \$4,000,000 for aquaculture grants as authorized by section 1475 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3322) and other Acts; [\$7,400,000]
 - 5 \$8,825,000 for sustainable agriculture research and education, as authorized by section 1621 of Public Law 101-624 (7 U.S.C. 5811), including administrative expenses; and [\$22,655,000] \$11,891,000 for necessary expenses of Cooperative State Research Service activities, including coordination and program leadership for higher education work of the Department, administration of payments to State agricultural experiment stations, funds for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), of which \$10,550,000 shall be for a program of capacity building grants to colleges eligible to receive funds under the Act of August 30, 1890 (7 U.S.C. 321-326 and 328),

- 6 including Tuskegee University, to remain available until expended (7 U.S.C. 2209b), of which not to exceed \$100,000 shall be for employment under 5
- 7 U.S.C. 3109; in all, [\$453,736,000: Provided, That none of the funds appropriated or otherwise made available by this Act shall be used to support the price of wool or mohair by means of loans, purchases, payments, or other operations, except for marketing year 1993.] \$418,548,000.

The first change revises the language to make specific reference to special grants, consistent with the amendment to this authority in the Food, Agriculture, Conservation, and Trade Act of 1990; adds language to provide for administrative expenses; and clarifies the U.S. Code citation.

The second change deletes language for research pursuant to the Critical Agricultural Materials Act of 1984. No funding is proposed for this program in 1995.

The third, fourth, and sixth changes move the citation for no-year funding from General Provision 706 to the specific programs previously cited in General Provision 706.

The fifth change identifies that these funds are for aquaculture grants and adds the U.S. Code citation.

The seventh change eliminates this provision which does not apply to CSRS programs.

COOPERATIVE STATE RESEARCH SERVICE

Appropriations Act, 1994	\$453,736,000
Morrill-Nelson	2,850,000
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Total, Appropriations Act, 1994	456,586,000
Budget Estimate, 1995	421,398,000
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Decrease in Appropriations	-35,188,000
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SUMMARY OF INCREASES AND DECREASES

Item of Change	1994 Estimated	Pay Cost	Other Changes	1995 Estimated
Payments under the Hatch Act ...	\$171,304,000	- -	- -	\$171,304,000
Cooperative forestry research ..	20,809,000	- -	- -	20,809,000
Payments to 1890 colleges and Tuskegee University	28,157,000	- -	- -	28,157,000
Special research grants	87,110,000	- -	-\$42,274,000	44,836,000
National Research Initiative competitive grants	112,150,000	- -	+17,850,000	130,000,000
Animal health and disease research, Section 1433	5,551,000	- -	- -	5,551,000
Federal administration (direct appropriation)	22,655,000	+\$125,000	-10,889,000	11,891,000
Higher education: Morrill-Nelson	2,850,000	- -	- -	2,850,000
Other	6,000,000	- -	- -	6,000,000
Total Available	456,586,000	+125,000	-35,313,000	421,398,000
<hr/>				
Recap:				
Direct appropriations	453,736,000	+125,000	-35,313,000	418,548,000
Permanent appropriations	2,850,000	- -	- -	2,850,000
TOTAL	456,586,000	+125,000	-35,313,000	421,398,000
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PROJECT STATEMENT - CURRENT LAW
(On basis of appropriation)

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: :Years:	Amount	Staff: :Years:		Amount	Staff: :Years:
1. Hatch Act							
Research program:							
Formula funds	\$124,474,748		\$126,288,428		-	\$126,288,426	
Regional research ..	39,482,313		40,112,063		-	40,112,063	
Subtotal	163,957,061		166,400,491		-	166,400,491	
Federal Admin. (3%)	4,827,939		4,903,509		-	4,903,509	
Total	168,785,000	60	171,304,000	60	-	171,304,000	60
2. Cooperative Forestry							
Research:							
Research program	17,977,010		20,184,730		-	20,184,730	
Federal Admin. (3%)	555,990		624,270		-	624,270	
Total	18,533,000	6	20,809,000	6	-	20,809,000	6
3. Payments to 1890							
Colleges & Tuskegee							
University:							
Research program	26,578,000		27,312,290		-	27,312,290	
Federal Admin. (3%)	822,000		844,710		-	844,710	
Total	27,400,000	10	28,157,000	10	-	28,157,000	10
4. Special Research Grants:							
Aflatoxin research, IL :	134,000		134,000		-134,000	-	
Agribusiness manage-							
ment, Mississippi ... :	75,000		75,000		-75,000	-	
Agricultural diversifi-							
cation, Hawaii :	154,000		154,000		-154,000	-	
Agricultural manage-							
ment systems, MA :	261,000		261,000		-261,000	-	
Agricultural Process-							
ing, Georgia	50,000		-		-	-	
Agricultural trade, ND :	350,000		-		-	-	
Alfalfa research, KS :	125,000		125,000		-125,000	-	
Alternative cropping							
systems in the							
Southeast, S. Carolina :	278,000		278,000		-278,000	-	
Alternative crops, ND :	700,000		700,000		-700,000	-	
Alternative Crops for							
arid lands, Texas ... :	-		100,000		-100,000	-	
Alternative marine &							
fresh water species, MS :	275,000		275,000		-275,000	-	
Alternative pest							
control, Arkansas ... :	1,400,000		1,400,000		-1,400,000	-	
Alternative to							
Oinoseb, Oregon :	225,000		-		-	-	
Animal Science Food							
Safety Consortium ... :	1,942,000		1,942,000		-1,942,000	-	
Animal waste disposal,							
Michigan	120,000		-		-	-	
Apple pest control, CA :	-		250,000		-250,000	-	
Apple quality re-							
search, Michigan :	94,000		-		-	-	
Aquaculture research							
(general)	316,000		316,000		-316,000	-	
Aquaculture, Illinois :	200,000		200,000		-200,000	-	
Aquaculture, LA	390,000		390,000		-390,000	-	
Aquaculture, Stone-							
ville, Mississippi .. :	700,000		700,000		-700,000	-	
Asian products lab., OR :	-		250,000		-250,000	-	
Asparagus yield							
decline, Michigan ... :	94,000		-		-	-	
Babco Institute, WI :	75,000		250,000		-250,000	-	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
Bean and beet re- search, Michigan	\$189,000		- -		- -	- -	
Beef carcass evaluation and identification	210,000		\$210,000		-\$210,000	- -	
Beef fat content, IA	237,000		237,000		-237,000	- -	
Biodiesel research, MO	50,000		150,000		-150,000	- -	
Broom snakeweed, NM	200,000		200,000		-200,000	- -	
Canola research, KS	100,000		100,000		-100,000	- -	
Celery fusarium, MI	39,000		- -		- -	- -	
Center for animal health: and productivity, PA	134,000		134,000		-134,000	- -	
Center for rural studies, Vermont	37,000		37,000		-37,000	- -	
Chesapeake Bay aqua- culture, Maryland	437,000		437,000		-437,000	- -	
Competitiveness of agriculture products							
Washington	800,000		800,000		-800,000	- -	
CONSOIL, Wisconsin	75,000		- -		- -	- -	
Controlled environ- mental production systems, PA	240,000		240,000		-240,000	- -	
Cool season legume research	387,000		387,000		-387,000	- -	
Cottonseed extraction and oil refining, TX	75,000		75,000		-75,000	- -	
Cranberry/blueberry disease & breeding, NJ	260,000		260,000		-260,000	- -	
CRP acreage usage, MO	- -		150,000		-150,000	- -	
Dairy goat research, Prairie View A&M, TX	75,000		75,000		-75,000	- -	
Delta rural health care, Arkansas	- -		117,000		-117,000	- -	
Delta rural revitali- zation, Mississippi	175,000		175,000		-175,000	- -	
Dogwood anthracnose, GA, NC & TN	137,000		137,000		-137,000	- -	
Dried bean research, MO	100,000		100,000		-100,000	- -	
Eastern filbert blight, Oregon	85,000		85,000		-85,000	- -	
Energy biomass/biofuels	- -		500,000		-500,000	- -	
Entomology acoustics detection, MS	- -		200,000		-200,000	- -	
Environmental re- search, New York	575,000		575,000		-575,000	- -	
Expanded wheat pasture, Oklahoma	337,000		337,000		-337,000	- -	
Export development, KY	227,000		- -		- -	- -	
Farm and rural busi- ness finance, IL & AR	125,000		125,000		-125,000	- -	
Farm computer tech- nology, Georgia	100,000		- -		- -	- -	
Fish marketing, OR & RI	340,000		340,000		-340,000	- -	
Floriculture, Hawaii	296,000		296,000		-296,000	- -	
Food & Agriculture Policy Institute							
Iowa & Missouri	750,000		750,000		-750,000	- -	
Food irradiation, IA	237,000		237,000		-237,000	- -	
Food Marketing Policy Center, Connecticut	393,000		393,000		-393,000	- -	
Food processing center, Nebraska	50,000		50,000		-50,000	- -	
Food systems group, Wisconsin	261,000		261,000		-261,000	- -	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
Forestry marketing, VT and NH	\$50,000		\$50,000		-\$50,000	- -	
Forestry research, AR ..	- -		500,000		-500,000	- -	
Fruit & vegetable mrkt. analysis, AZ & MO ..	- -		350,000		-350,000	- -	
Generic commodity promotion, NY, AL, TX, WI ..	- -		250,000		- -	- -	
Global change	2,000,000		1,250,000		+1,750,000	\$3,000,000	
Global marketing support service, Arkansas:	- -		50,000		-50,000	- -	
Grass seed crop, system: for sustainable ag. ...	- -		500,000		-500,000	- -	
Grasshopper biocontrol, North Dakota ..	75,000		- -		- -	- -	
Great Plains Agric. Policy Center, OK	100,000		50,000		-50,000	- -	
Human nutrition, AR ..	- -		500,000		-500,000	- -	
Human nutrition, Iowa ..	500,000		500,000		-500,000	- -	
Human nutrition, LA ..	800,000		800,000		-800,000	- -	
Human nutrition, NY ..	735,000		735,000		-735,000	- -	
Improved dairy management, PA	335,000		350,000		-350,000	- -	
Improved fruit practices, MI	- -		525,000		-525,000	- -	
Integrated pest management and biological control ..	4,457,000		3,228,000		+3,772,000	7,000,000	
Integrated production systems, OK	190,000		190,000		-190,000	- -	
International arid lands consortium	- -		350,000		-350,000	- -	
Iowa Biotechnology Consortium	2,000,000		2,000,000		-2,000,000	- -	
Jointed goatgrass control in wheat, WA ..	- -		350,000		-350,000	- -	
Livestock & dairy policy, NY & TX	525,000		525,000		-525,000	- -	
Lowbush blueberry research, Maine	185,000		221,000		-221,000	- -	
Low-input agric., MN ..	230,000		230,000		-230,000	- -	
Maple research, VT	99,000		99,000		-99,000	- -	
Massachusetts Biotechnology	256,000		- -		- -	- -	
Michigan Biotechnology Institute	2,358,000		2,358,000		-2,358,000	- -	
Midwest Adv. Food Manufacturing Alliance:	- -		500,000		-500,000	- -	
Midwest agricultural products, Iowa	700,000		700,000		-700,000	- -	
Midwest Biotechnology Consortium	2,865,000		2,865,000		-2,865,000	- -	
Midwest feeds consortium:	- -		500,000		-500,000	- -	
Milk safety, PA	184,000		285,000		-285,000	- -	
Minor crop pest control, Hawaii	285,000		- -		- -	- -	
Minor use animal drugs:	464,000		650,000		- -	650,000	
Multi-commodity research, OR	300,000		300,000		-300,000	- -	
Multi-cropping strategies for aquaculture, Hawaii	150,000		150,000		-150,000	- -	
National Biological Impact Assessment Program	300,000		300,000		- -	300,000	
Nematode resistance genetic engineering, New Mexico	150,000		150,000		-150,000	- -	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
New methods of weed control, ND	\$500,000	:	\$500,000	:	-\$500,000	- -	:
New uses for agricultural products, Ohio ..	140,000	:	140,000	:	-140,000	- -	:
Nonfood agricultural products, Nebraska ..	110,000	:	110,000	:	-110,000	- -	:
Oil resources from desert plants, NM ...	200,000	:	200,000	:	-200,000	- -	:
Oregon/Mass. Biotech.	- -	:	512,000	:	-512,000	- -	:
Peach tree short life, South Carolina ..	192,000	:	192,000	:	-192,000	- -	:
Perishable commodities, Georgia	250,000	:	250,000	:	-250,000	- -	:
Pest control alternatives	125,000	:	125,000	:	-125,000	- -	:
Pesticide clearance ..	3,500,000	:	6,750,000	:	+4,050,000	\$10,800,000	:
Pesticide impact assessment	2,968,000	:	1,568,000	:	+1,400,000	2,968,000	:
Pesticide research, WA	667,000	:	667,000	:	-667,000	- -	:
Phytophthora root rot, New Mexico	150,000	:	150,000	:	-150,000	- -	:
Potato research	1,435,000	:	1,435,000	:	-1,435,000	- -	:
Potato utilization, ND ..	250,000	:	- -	:	- -	- -	:
Poultry research, GA ..	516,000	:	- -	:	- -	- -	:
Preservation and processing, Oklahoma	267,000	:	267,000	:	-267,000	- -	:
Procerum root disease, Virginia	25,000	:	25,000	:	-25,000	- -	:
Product development & marketing center, ME ..	221,000	:	425,000	:	-425,000	- -	:
Red River Corridor, MN & ND	200,000	:	200,000	:	-200,000	- -	:
Regional barley gene mapping project	412,000	:	412,000	:	-412,000	- -	:
Regionalized implications of farm programs, MO & TX	348,000	:	348,000	:	-348,000	- -	:
Rural development centers	500,000	:	500,000	:	- -	500,000	:
Rural environmental research, Illinois ..	125,000	:	- -	:	- -	- -	:
Rural housing needs, NE:	80,000	:	80,000	:	-80,000	- -	:
Rural policies institute, AR, NE, MO ..	692,000	:	525,000	:	-525,000	- -	:
Russian wheat aphid ..	437,000	:	537,000	:	-537,000	- -	:
Safflower research, N. Dakota & Montana ..	250,000	:	- -	:	- -	- -	:
Seafood and aquaculture: harvesting, processing; marketing, MS	361,000	:	361,000	:	-361,000	- -	:
Seafood research, OR ..	327,000	:	325,000	:	-325,000	- -	:
Small fruit research, OR, WA, & ID	187,000	:	250,000	:	-250,000	- -	:
Soil and water research, Ohio	240,000	:	200,000	:	-200,000	- -	:
Southwest consortium for plant genetics & water resources	400,000	:	400,000	:	-400,000	- -	:
Soybean bioprocessing, Iowa	328,000	:	328,000	:	-328,000	- -	:
Soybean cyst nematode, Missouri	359,000	:	359,000	:	-359,000	- -	:
STEEP II - Water quality in Pacific Northwest	980,000	:	980,000	:	-980,000	- -	:
Stone fruit decline, MI:	283,000	:	- -	:	- -	- -	:
Subirrigation research, Michigan	531,000	:	- -	:	- -	- -	:

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
Flower insects,							
and SO	\$200,000		\$150,000		-\$150,000	- -	
Sustainable ag., MI ..	- -		525,000		-525,000	- -	
Sustainable agriculture:							
and natural re-							
sources, PA	100,000		100,000		-100,000	- -	
Sustainable agri-							
culture systems, NE ..	70,000		70,000		-70,000	- -	
Swine research, MN ..	140,000		140,000		-140,000	- -	
Taxol cultivation, CT ..	- -		50,000		-50,000	- -	
TCK smut (wheat)	250,000		- -		- -	- -	
Tillage, silviculture,							
waste mgmt, LA	- -		250,000		-250,000	- -	
Tropical and sub-							
tropical research ...	3,320,000		3,320,000		-3,320,000	- -	
Urban pests, Georgia ..	76,000		76,000		-76,000	- -	
Value-added wheat							
product develop., KS ..	- -		250,000		-250,000	- -	
Waste utilization, NC ..	- -		440,000		-440,000	- -	
Water conservation, KS ..	94,000		94,000		-94,000	- -	
Water conservation, NV ..	200,000		200,000		-200,000	- -	
Water management, AL ..	398,000		398,000		-398,000	- -	
Water quality	8,950,000		4,500,000		- -	\$4,500,000	
Wheat genetics, KS ..	159,000		209,000		-209,000	- -	
White mold research, OH:	55,000		- -		- -	- -	
Wild rice research, MN ..	88,000		- -		- -	- -	
Wood utilization	4,153,000		4,443,000		-4,443,000	- -	
Wool research	250,000		250,000		-250,000	- -	
World food systems,							
Indiana and Ohio	368,000		- -		- -	- -	
Federal Admin. (4%) ..	(2,936,440)		(2,916,680)		(-1,727,960)	(1,188,720)	
Total	73,411,000		72,917,000 (a)		-43,199,000	29,718,000	
Critical Agricultural							
Materials Act of 1984							
Research program	388,000		485,000		-485,000	- -	
Federal Admin. (3%) ..	12,000		15,000		-15,000	- -	
Total	400,000		500,000		-500,000	- -	
Rangeland Research							
Grants (Subtitle M):							
Research program	460,750		460,750		- -	460,750	
Federal Admin. (3%) ..	14,250		14,250		- -	14,250	
Total	475,000		475,000		- -	475,000	
Aquaculture Centers,							
Section 1475:							
Research program	3,880,000		3,880,000		- -	3,880,000	
Federal Admin. (3%) ..	120,000		120,000		- -	120,000	
Total	4,000,000		4,000,000		- -	4,000,000	
Sustainable Agriculture:							
Program	6,523,250		7,178,000		+1,382,250	8,560,250	
Federal Admin. (3%) ..	201,750		222,000		+42,750	264,750	
Total	6,725,000		7,400,000		+1,425,000	8,825,000	
Supplemental and							
Alternative Crops,							
Sec. 14730:							
Crambe/Rapeseed	500,000		500,000		-500,000	- -	
Guayule research	668,000		668,000		-668,000	- -	
Canola research	- -		500,000		-500,000	- -	
Hesperaloe research ..	- -		150,000		-150,000	- -	
Advanced Materials ..	- -		- -		+1,818,000	1,818,000	
Federal Admin. (3%) ..	(35,040)		(54,540)		- -	(54,540)	
Total	1,168,000		1,818,000		- -	1,818,000	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
State Agricultural Weather Information System, Sec. 1640 ...	\$388,000	:	-	:	-	-	:
Federal Admin. (3%)	12,000	:	-	:	-	-	:
Total	400,000	:	-	:	-	-	:
5. National Research Initiative (NRI):	86,579,000	37	\$87,110,000	38	-\$42,274,000 (1)	\$44,836,000	36
Natural Resources and the Environment	18,000,000	:	23,750,000	:	+3,250,000	27,000,000	:
Nutrition, Food Safety, & Health	6,500,000	:	8,000,000	:	+3,000,000	11,000,000	:
Plants	40,000,000	:	43,900,000	:	+3,100,000	47,000,000	:
Animals	25,000,000	:	25,000,000	:	+4,500,000	29,500,000	:
Processing for Adding Value or Developing New Products	4,000,000	:	7,500,000	:	+1,500,000	9,000,000	:
Markets, Trade, and Rural Development	4,000,000	:	4,000,000	:	+2,500,000	6,500,000	:
Federal Admin. (4%)	(3,900,000)	:	(4,486,000)	:	(+714,000)	(5,200,000)	:
Total	97,500,000	67	112,150,000	74	+17,850,000 (2)	130,000,000	84
6. Animal Health and Disease Research, Section 1433:							
Research program	5,328,960	:	5,328,960	:	-	5,328,960	:
Federal Admin. (4%)	222,040	:	222,040	:	-	222,040	:
Total	5,551,000	2	5,551,000	2	-	5,551,000	2
7. Federal Administration (Direct App.):							
Ag development in American Pacific	-	:	647,000	:	-647,000	-	:
Center for No. American Studies, TX	-	:	100,000	:	-100,000	-	:
Gulf Coast shrimp aquaculture	3,500,000	:	3,500,000	:	-3,500,000	-	:
Mississippi Valley State University	668,000	:	668,000	:	-668,000	-	:
Iowa State-Center for Ag. & Rural Dev.	750,000	:	750,000	:	-750,000	-	:
Geographic Information System Pilot Program	1,000,000	:	1,075,000	:	-1,075,000	-	:
Vocational Agriculture Curriculum, Aquaculture	500,000	:	500,000	:	-500,000	-	:
Maize Genetics Research Center, Univ. of ND	400,000	:	-	:	-	-	:
Herd Management Prog., Tennessee State Univ.	475,000	:	613,000	:	-613,000	-	:
Alternative Fuels Characterization Lab., University of ND	250,000	:	250,000	:	-250,000	-	:
Water Quality, So. Illinois University	750,000	:	750,000	:	-750,000	-	:
Water Quality, Univ. of North Dakota	500,000	:	500,000	:	-500,000	-	:
Office of Grants and Program Systems	334,000	:	334,000	:	-226,000	\$108,000	:
Office of Agricultural Biotechnology	400,000	:	400,000	:	-	400,000	:
Ag in the Classroom	208,000	:	208,000	:	-208,000	-	:
Peer Panels	260,000	:	260,000	:	+240,000	500,000	:
PH-10 study, CA & WA		:	1,000,000	:	-1,000,000	-	:
Previous Year Pay Costs	550,000	:	550,000	:	-	550,000	:
New Pay Costs	-	:	-	:	+125,000	125,000	:
1850 Capacity Building Grants	10,250,000	:	10,550,000	:	-	10,550,000	:
Administrative overhead	-	:	-	:	-48,000	(48,000)	:
Staff year reduction	-	:	-	:	-294,000	(294,000)	:
Total	20,795,000	15	22,655,000 (b)	15	-10,764,000 (3)	11,891,000	15

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff Years
8. Higher Education:							
Graduate Fellowships							
Grants	\$3,500,000		\$3,500,000		- -	\$3,500,000	
Institution Challenge							
Grants	1,500,000		1,500,000		- -	1,500,000	
Morrill-Nelson Funds							
(Permanent Appro.) ..	2,850,000		2,850,000		- -	2,850,000	
Multicultural Scholars							
Program	- -		1,000,000		- -	1,000,000	
Federal Admin. (3%) ..	(150,000)		(180,000)		- -	(180,000)	
Total	7,850,000	9	8,850,000	11	- -	8,850,000	11
Total Available or estimate	432,993,000	206	456,586,000	216	-35,188,000	421,398,000	226

(a) A rescission of \$20,213,000 million has been proposed for fiscal year 1994.

(b) A rescission of \$9,789,000 million has been proposed for fiscal year 1994.

EXPLANATION OF PROGRAM

The funds appropriated for the Cooperative State Research Service (CSRS) provide the Federal Government's support for research and education programs at land-grant agricultural experiment stations, approved schools of forestry, the 1890 land-grant institutions and Tuskegee University, colleges of veterinary medicine, and other eligible institutions in the fifty States and in Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, Micronesia, and the Northern Mariana Islands.

The State institutions conduct research and experiments on the problems continuously encountered in the development of a permanent and sustaining agriculture and forestry, and in the improvement of the economic and social welfare of rural and urban families. Because of differences in climate, soil, market outlets, and other local conditions, each State has distinct problems in the production and marketing of crops and livestock. Farmers, foresters, and rural people in the individual States naturally look to their State Agricultural Experiment Stations, universities, and colleges for solution of the State and local problems and request services to help meet changing conditions.

Research programs at State institutions, to be most effective, include participation in regional and national programs. Joint effort by a group of State institutions is the most effective and often the only practical approach to problems of common interest. The stations are acting together as regional groups to provide cooperative, coordinated attacks on problems of regional and national interest. In a similar manner, the research programs of the State institutions and the Department of Agriculture are complementary and interdependent.

The Federal formula funds constitute a powerful force in bringing about inter-State cooperation and Federal-State collaboration in the planning and conduct of this overall program of agricultural research. Therefore, the impact of the Federal formula funds is far greater than would be expected solely on the basis of the amount of funds provided.

Research at the State institutions is organized into a program of projects that is submitted for approval by the Cooperative State Research Service. The program of projects is financed wholly or in part from Federal formula and grant funds. Programs and projects are evaluated periodically with station scientists by administrators and scientific staff of the Cooperative State Research Service. The evaluation includes consideration of quality and productivity of the program and projects. The continuing process of research evaluation by station scientists and the staff of the Cooperative State Research Service results in a dynamic program with approximately 15 to 20 percent of the projects being replaced by new and/or revised projects each year.

The Department's higher education mission is carried out in strong alliance with States, universities, and the private sector. Recognizing the significance of this alliance, the Food and Agriculture Act of 1977 designated USDA as the lead Federal agency for higher education in the food and agricultural sciences. Through the CSRS Office of Higher Education Programs, USDA has implemented that charge with a broad array of initiatives to link teaching, research, and extension and improve the training of food and agricultural scientists and professionals. Most of these efforts were informal until 1984, when the Department initiated the National Needs Graduate Fellowships Grants Program to develop expertise in areas with scientific shortages. This role was expanded significantly in recent years by implementation of the Higher Education Challenge Grants Program, the 1890 Institution Teaching and Research Capacity Building Grants Program, and the

Higher Education Multicultural Scholars Program, all of which are intended to strengthen the quality of education programs at U.S. colleges and universities.

Appropriations for the Cooperative State Research Service activities are authorized under the following Acts:

1. Payments to agricultural experiment stations under the Hatch Act
Agricultural Experiment Stations Act of August 11, 1855, Hatch Act of 1887 as amended - 7 U.S.C. 361a-361i, Public Law 92-318; Public Law 93-471; Public Law 95-113, as amended; Public Law 95-134; Public Law 96-205; Public Law 96-374; Public Law 96-597; Public Law 97-98; Public Law 98-213; Public Law 98-454; Public Law 99-198; Public Law 99-396; Public Law 101-624.

Funds under the Hatch Act are allocated to the State Agricultural Experiment Stations of the 50 States, District of Columbia, Puerto Rico, Guam, the Virgin Islands, Micronesia, American Samoa, and Northern Mariana Islands for research to promote a sound and prosperous agriculture and rural life. The Hatch Act provides that the distribution of Federal payments to States for fiscal year 1955 shall become a fixed base and that any sums appropriated in excess of the 1955 level shall be distributed in the following manner:

- 20% shall be allotted equally to each State.
- not less than 52% shall be allotted to the States as follows:
 - one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
 - one-half in an amount proportionate to the relative farm population of each State to the total farm population of all States.
- not more than 25% shall be allotted to the States for cooperative research in which two or more State Agricultural Experiment Stations are cooperating to solve problems that concern the agriculture of more than one State.
- 3% shall be available to the Secretary of Agriculture for the administration of this Act.

The Act also provides that any amount in excess of \$90,000 available for allotment to any State, exclusive of the regional research fund, shall be matched by the State out of its own funds available for research, and for the establishment and maintenance of facilities necessary for the performance of such research. Also, in the case of Guam, the Virgin Islands, Micronesia, American Samoa, and Northern Mariana Islands, agencies are required by law to waive any requirement for local matching funds under \$200,000. If any State fails to make available a sum equal to the amount in excess of their matching requirement to which it may be entitled, the remainder of such amount shall be withheld by the Secretary of Agriculture and reapportioned among the States.

Three percent of funds appropriated under the Hatch Act is set-aside for Federal administration. Administration includes disbursement of funds and a continuous review and evaluation of the research programs of the State Agricultural Experiment Stations supported wholly or in part from Hatch funds. The Cooperative State Research Service encourages and assists in the establishment of cooperation within and between the States, and also actively participates in the planning and coordination of research programs between the States and the Department at the regional and national levels.

2. Cooperative Forestry Research - The Cooperative Forestry Research Act of October 10, 1962, 16 U.S.C. 582a-7; Public Law 96-374; Public Law 97-98; Public Law 99-198; Public Law 101-624.

The Act authorizes funding of research in State institutions certified by a State representative designated by the governor of each State. The Act provides that appropriated funds be apportioned among States as determined by the Secretary after consultation with a national advisory council of not fewer than sixteen members representing Federal and State agencies concerned with developing and utilizing the Nation's forest resources, the forest industries, the forestry schools of the State-certified eligible institutions, State Agricultural Experiment Stations, and volunteer public groups concerned with forests and related natural resources. Determination of apportionments follows consideration of pertinent factors including areas of non-Federal commercial forest land, volume of timber cut from growing stock, and the non-Federal dollars expended on forestry research in the State. The Act also provides that payments must be matched by funds made available and budgeted from non-Federal sources by the certified institutions for expenditure for forestry research. Three percent of funds appropriated under this Act is set-aside for Federal administration.

3. Payments to 1890 Colleges and Tuskegee University - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1445, Public Law 95-113; Public Law 96-547; Public Law 97-98; Public Law 99-198; Public Law 101-624.

Public Law 95-113, as amended, provides for support of continuing agricultural research at colleges eligible to receive funds under the Act of August 30, 1890, including Tuskegee University. Beginning with fiscal year 1979, there shall be appropriated funds for each fiscal year, an amount not less than 15 percent of the total for such year under Section 3 of the Act of March 2, 1887. Distribution of payments made available under section 2 of the Act of August 4, 1965, for fiscal year 1978 are a fixed base and sums in excess of the 1978 level shall be distributed as follows:

- 3% shall be available to the Secretary of Agriculture.
- Payments to States in fiscal year 1978 is a fixed base. Of funds in excess of this amount:
 - 20% shall be allotted equally to each State.
 - 40% shall be allotted in an amount proportionate to the rural population of the State in which the eligible institution is located to the total rural population of all the States in which eligible institutions are located, and
 - 40% shall be allotted in an amount proportionate to the farm population of the State in which the eligible institution is located to the total farm population of all the States in which eligible institutions are located.

Allotments to Tuskegee University and Alabama A&M University shall be determined as if each institution were in a separate State. Three percent of the funds appropriated under this Act is set-aside for Federal administration.

4. Special Research Grants- Section 2(c), Act of August 4, 1965, 7 U.S.C. 450i(c), as amended by Public Law 95-113; Public Law 97-98; Public Law 98-284; Public Law 99-198; Public Law 101-624.

Section 2(c) of the Act of August 4, 1965, as amended, authorizes Special Research Grants for periods not to exceed five years to State Agricultural Experiment Stations, all colleges and universities, other research institutions and organizations, Federal agencies, private organizations or corporations, and individuals for the purpose of conducting research to facilitate or expand promising breakthroughs in areas of the food and agricultural sciences of importance to the United States; and to State Agricultural Experiment Stations, land-grant colleges and universities, research foundations established by land-grant colleges and universities,

colleges and universities receiving funds under the Act of October 10, 1962, and accredited schools or colleges of veterinary medicine for the purpose of facilitating or expanding ongoing State-Federal food and agricultural research programs. Special Research Grants are awarded on the discretionary basis as well as using a competitive peer panel process in the selection of proposals to be funded. Four percent of funds appropriated for this program is set-aside for Federal administration.

Research grants are also awarded under the Critical Agricultural Materials Act, Public Law 98-284, as amended. Rangeland Research Grants are awarded in accordance with Subtitle M of Public Law 97-98. Grants are awarded to aquaculture centers under section 1475(d) of Public Law 95-113, as amended. Grants for supplemental and alternative crops are awarded under section 1473D of Public Law 95-113. Grants for sustainable agriculture research and education are awarded under section 1621 of Public Law 101-624. Three percent of funds appropriated for these programs is set-aside for Federal administration.

5. National Research Initiative Competitive Grants - Section 2(b), Act of August 4, 1965, 7 U.S.C. 450i(b), as amended by Public Law 95-113; Public Law 97-98; Public Law 99-198; Public Law 101-624.

Section 2(b) of the Act of August 4, 1965, as amended, authorizes Competitive Research Grants for periods not to exceed five years to State Agricultural Experiment Stations, all colleges and universities, other research institutions and organizations, Federal agencies, private organizations or corporations, and individuals to further the programs of the Department of Agriculture. By obtaining the participation of outstanding researchers in the entire U.S. scientific community, emphasis will be placed on research in the areas of natural resources and the environment; nutrition, food safety, and health; plants; animals; markets, trade and rural development; and processing for adding value or developing new products. Four percent of funds appropriated for this program is set-aside for Federal administration.

6. Animal Health and Disease Research - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1433, Public Law 95-113; Public Law 97-98; Public Law 99-198; Public Law 101-624.

Section 1433 provides for support of livestock and poultry disease research in accredited schools or colleges of veterinary medicine or State Agricultural Experiment Stations that conduct animal health and disease research. These funds shall be distributed as follows:

- 4% shall be retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.
- 48% shall be distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to the total value of and income to producers from domestic livestock and poultry in all the States.
- 48% shall be distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health research capacity in all the States.

Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of \$100,000 under this authorization.

7. Federal Administration (direct appropriation) - Authority for direct appropriations is provided in the annual Agriculture, Rural Development, Food and Drug Administration and Related Agencies Appropriations Act. These funds are used to provide support services in connection with planning and

coordination of all programs administered by Cooperative State Research Service. Certain research and higher education program grants, including the 1890 Institution Teaching and Research Capacity Building Grants Program, are also funded under this item.

8. Higher Education - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1417, Public Law 95-113; Public Law 97-98; Public Law 99-198; Second Morrill Act of 1890; Public Law 100-339; Public Law 101-624.

Higher Education-Graduate Fellowships Grants pursuant to Section 1417(b)(6) are awarded on a competitive basis to colleges and universities to conduct graduate training programs to stimulate the development of food and agricultural scientific expertise in targeted national need areas. Typically graduate students in the food and agricultural sciences require a minimum of four years to complete a doctoral degree. The USDA fellowships program provides support for doctoral study for three years, and the universities are expected to support the student's fourth year of dissertation research. Three percent of funds appropriated for this program is set-aside for Federal administration.

Institution Challenge Grants pursuant to Section 1417 (b)(1) are designed to stimulate and enable colleges and universities to provide the quality of education necessary to produce graduates capable of strengthening the Nation's food and agricultural scientific and professional work force. All federal funds awarded under this program must be matched by the universities on a dollar-for-dollar basis from non-Federal sources. Three percent of funds appropriated for this program is set-aside for Federal administration.

The Higher Education Multicultural Scholars Program pursuant to Section 1417 (b)(5) will increase the ethnic and cultural diversity of the food and agricultural scientific and professional work force and advance the educational achievement of minority Americans. It is open to all colleges and universities with baccalaureate or higher degrees in Agriculture, Forestry, Natural Resources, Home Economics, Veterinary Medicine, and closely allied fields. Federal funds provide 75 percent of the four-year scholarship awards; the remaining 25 percent is contributed by the grantee institutions. Three percent of funds appropriated for this program is set-aside for Federal administration.

Higher education in the food and agricultural sciences at the land-grant institutions is also supported through a permanent appropriation in the Second Morrill Act of 1890, as amended. Each state and territory receives \$50,000 per year.

Audit Reports

#13545-1-HY, 10/01/92, audit report of Pennsylvania State University for the fiscal year ended 06/30/90 (closed).

#13545-2-HY, 11/13/92, audit report of Pennsylvania State University for the fiscal year ended 06/30/91 (closed).

#50563-85-KC, 03/01/93, OMB Circular A-133 audit of Lincoln University, Missouri, for the fiscal year ended 06/30/92 (closed).

#50563-90-SF, 07/13/93, OMB Circular A-110 audit of Northern Marianas College for the two year period ended 09/30/90 (open).

#50563-202-AT, 08/05/93, OMB Circular A-128 audit of Fort Valley State College for the fiscal year ended 06/30/89 (open).

#50568-109-HY, 12/23/92, OMB Circular A-128 audit of the University of Puerto Rico for the fiscal years ended 06/30/87 and 06/30/88 (open).

#50568-257-KC, 03/19/93, OMB Circular A-128 audit of the state of Iowa for the fiscal year ended 06/30/91 (closed).

#50568-263-KC, 07/13/93, OMB Circular A-128 audit of the state of Montana for the two years ended 06/30/91 (open).

#50568-494-SF, 11/04/92, OMB Circular A-128 audit of the University of Idaho for the two years ended 06/30/91 (closed).

#50568-521-SF, 06/01/93, OMB Circular A-128 audit of the state of Washington for the fiscal year ended 06/30/91 (closed).

#PS-0299-0022, 12/21/92, hotline complaint - University of Georgia (open).

#PS-1399-0005, 11/19/92, hotline complaint - University of Washington (closed).

Audits In Progress

#13099-2-KC, 08/23/93, discussion draft, Grantee Compliance with Small Business Innovation Research Program Provisions (open).

JUSTIFICATION OF INCREASES AND DECREASES

- (1) A net decrease of \$42,274,000 for Special Research Grants and Critical Agricultural Materials Act (\$87,110,000 available in 1994) consisting of:
- (a) An increase of \$1,750,000 for the Global Change Special Research Grant (\$1,250,000 available in 1994 for UV-B monitoring).

Need for Change. A somewhat distinct, but very important, facet of Global Change Research is the observation and analysis of ultraviolet-B (UV-B) radiation. UV-B is subject to being changed by a variety of chemicals used for refrigeration and many other purposes which have been and are being released into the stratosphere. These chemicals destroy stratospheric ozone, which filters out some of the UV-B that could reach the earth. During the last several years, there have been indications that, as a result of stratospheric ozone destruction, there could be an increase of UV-B radiation at the earth's surface. There is a lack of data on the geographical and temporal trends in UV-B radiation. A monitoring network is essential to determine these trends as this part of the solar spectrum can be detrimental to crops, trees, animals, and humans. The increase requested is needed for expansion of the monitoring network begun by CSRS. This network has been reviewed and coordinated with other Federal research agencies through the U.S. Global Change Research Program.

Nature of Change. Funding for the UV-B monitoring network will be used to bring the new network closer to complete operational status for obtaining UV-B information at ground level. As envisioned, the overall operation of this program will include development of 8 to 10 intensive sites at which sophisticated research instruments will be used to collect very high quality data. The network will also deploy some less costly field instruments which will provide UV-B trends and status information. Essential to operation of the network is a laboratory to periodically

recalibrate and recharacterize the UV-B instruments in order to maintain data quality. A network is being built with the capacity to utilize data from both research and field instruments, and to make the data available to scientists and the public. The purpose of the network is to provide a database of UV-B radiation in the United States, which is complementary to similar networks in other parts of the world. When valid baseline information has been obtained it will be possible to determine where UV-B increases, decreases, or stability are occurring. If increases of significant levels are observed, action to adapt to the changes could be initiated. Creating a national UV-B monitoring network requires a sustained, mission-focused, programmatic effort to develop instrumentation, and establish and maintain linked research sites to provide baseline data for agricultural research which can best be accomplished under this special research grant. Fundamental studies of responses of plants and animals to UV-B are under way in the National Research Initiative, as well as basic and applied science conducted through the State Agricultural Experiment Stations.

- (b) An increase of \$3,772,000 for Integrated Pest Management and Biological Control Special Research Grant (\$3,228,000 available in 1994).

Need for Change. Major innovations are needed to effect change in the way crop pests are controlled. Over 500 pest species are resistant to their pesticides, few new pesticides are being developed, and those presently available are being lost due to regulatory use restrictions or due to mandated re-registration. Agricultural producers are facing unprecedented economic and regulatory challenges in their production of crops. It is the responsibility of USDA and its partner State Land-Grant Universities to lead the innovation in pest control methods and programs that give producers an economic edge in the global markets while protecting and improving the quality of our environment and the safety and quality of our food and feeds.

CSRS in partnership with the leadership of the Land-Grant University System has set the stage for development of innovative crop protection that meets economic and environmental needs in a plan entitled "Blueprint for Integrated Pest Management for the 21st Century." This plan is the basis for the CSRS Regional IPM Program. This plan builds upon the transition that has occurred in the Land-Grant University system. Today's focus of the scientific expertise of the system is toward the development and implementation of natural controls of pests (biological control, host resistance, and cultural controls) which serve as the basis for the development of alternative pest management technologies. Today's focus is for close linkages with research and implementation programs to address alternative pest management technologies for multiple pest problems in production systems.

Today, over 450 scientists and extension specialists are working on the development and implementation of biological control, the first priority for increased research and implementation emphasis for alternative pest management. Coordination mechanisms proposed last year provide new opportunities for implementation of biological control. A National Biological Control Program (NBCP) has been proposed by CSRS, APHIS, ARS, ES, and FS. The NBCP is ultimately expected to allow for greater coordination among USDA agencies and University research and extension programs and make it possible to launch coordinated basic and applied research, demonstration, and education programs. Each of the USDA agencies involved in the NBCP have unique and interdependent strengths to bring to this initiative. Program change is needed to fuel a flourishing and rapidly emerging industry in pest management. This industry of the future will be a new kind of industry, being targeted to narrow, specialized market niches such as for the production and commercialization of

biological control agents. The industry needs to be supported by the development of a research base which includes all modern technologies, including biotechnology. The products of this industry will require a framework for implementation which can be provided by the CSRS IPM programs.

The Administration has made the reduction of risk from the use of pesticides a top priority. In June 1993, USDA, along with the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA), announced a joint initiative to reduce pesticide use risks by emphasizing Integrated Pest Management and sustainable agricultural practices. This special research grant supports the Administration's initiative.

Nature of Change. The Integrated Pest Management Special Research Grant program is administered by CSRS through four, regional competitive grants programs. Each region has an established IPM grants program that reflects both the special needs of the region and the overall programmatic direction provided by ESCOP and CSRS. A \$7.0 million program will allow for regional IPM programs in two program areas: Biological Control and Integrative Research. All projects and programs are funded through a peer review competitive grant process.

Biological Control (\$2.2 million, an increase of \$1.684 million over 1994). CSRS will develop and implement biological control solutions to pest management systems through a coordinated state and federal program. This program will continue to discover, develop and implement biological control organisms and methods of use against pests such as various fruit flies, including mole cricket, Mediterranean fruit fly, gypsy moth, codling moth, various aphids, boll weevil, root knot and soybean cyst nematodes, citrus canker, citrus tristeza virus, soil borne diseases, various pests of stored grains, fruits, and nuts, and facefly, stablefly and housefly.

Integrative Research (\$4.8 million, an increase of \$2.088 million over 1994). This increase will permit expansion of systems research and joint research/extension projects such as the implementation of IPM for vegetable cropping systems in the North Central Region which emerges from a decade of innovative research. This research/implementation program focuses on multiple strategies to manage multiple pests, fertilizer use and irrigation practices, in a multi-commodity production system. Resources will also be used to initiate demonstration programs with ARS, APHIS, ES, and other USDA agencies and EPA on areawide pest management systems that will interface multi-commodity and multi-pest IPM systems with areawide pest management approaches. Areawide pest management systems will expand on the successes of IPM programs in the State Agricultural Experiment Stations, Cooperative Extension system, ARS, and APHIS and provide the mechanism for increased collaboration with the other agencies of USDA and with EPA to demonstrate improved IPM systems. This component of the program also provides support for application technology, cultural control, host plant resistance, resistance management, and for emerging pest problems that address priority IPM system needs, such as the outbreak of a new strain of Late Blight fungus in the Northeast.

This special research grant program complements the National Research Initiative (NRI) by developing innovative information from the NRI program. Regional IPM funds provide the critical conduit that takes basic fundamental knowledge and develops pest, crop, and region specific crop and pest management systems and identifies basic research priorities where information gaps impede the development of alternative pest management strategies.

- (c) An increase of \$4,050,000 for Pesticide Clearance Special Research Grant (\$6,750,000 available in 1994).

Need for Change. The 1988 amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) have created a serious potential loss of over 3,500 pesticide uses important to minor crop farmers. If American agriculture is to have available the legally registered materials necessary to provide for a wholesome and nutritious diet for the consuming public and to supply them with the ornamental plants to beautify their environment, it is essential to meet these regulatory demands.

The 1988 FIFRA amendments greatly accelerated the need for reregistration of many currently used pesticides. Reregistration of previously registered pesticides will require redoing much of the original research using current state-of-the-art technology. There is no patent protection and very little economic incentive for commercial companies to reregister these older pesticides, especially for minor uses. In contrast, the economics to the user are excellent, and further, these older pesticides have been researched and incorporated into sound environmental management systems. Their loss would be a severe restriction to pest management programs.

CSRS appointed a review team comprised of representatives of State Agricultural Experiment Stations, Federal agencies involved in IR-4, the pesticide industry, and producer groups to examine the IR-4 program. Their report (February 1991) concluded that IR-4 needs a significant increase in its direct funding in order to serve the needs of the \$19.3 billion minor crop industry in a timely and comprehensive fashion. A GAO audit noted that "IR-4 officials believe that the IR-4 research grant project makes effective use of its limited resources... This is because IR-4 uses the existing land-grant university infrastructure, targets its research agenda to include those pesticide uses most likely to be approved by EPA, and annually reviews its research priorities." The report concludes with criticism of "...USDA... (having) been slow to respond to the need for pesticides on minor crops, even though IR-4 officials at the regional level developed a strategic plan in 1989 to address this need."

Nature of Change. The increased support is required for the expansion of the reregistration process for minor use agricultural commodities and the initial registration of safer and more environmentally compatible pesticides. The Administration's working group on food safety and pesticide use issues identified the minor use crop issue as a priority. This request supports the Administration's initiative to reduce the risk from the use of pesticides. IR-4 will dedicate 15 percent of increased funding to research biological control agents. FY 1993 funds for biological control were approximately \$500,000. The program is addressing requests for assistance in the registration of both food and ornamental crops. IR-4 receives about 275 valid requests from growers, extension personnel, research scientists and ranchers each year and has a large backlog of valid researchable requests, currently approaching 2,200. These increased funds will support the completion of significantly more tolerance projects. At the proposed level of funding, IR-4 expects to complete about 560 projects per year. The deadline for completion of reregistration mandated by FIFRA 88 amendments is 1998. Thus, with this increased level of funding, and if continued through 1998, IR-4 will support an estimated 2,240 projects for new registration and reregistration which is 67 percent of all current requests and backlogs. To meet these demands, the research activities of the IR-4 program will be expanded to include additional field experiments and the resultant chemical analyses for residues. All requests are rigorously reviewed and addressed in order of priority. Producers can increase the priority of their request by contributing funding. IR-4 staff encourage producers to contribute to the cost of reregistration. The final product of the increased support will be an increased number of chemical

and biological products available for use on minor crops. The research efforts of IR-4 are long term and highly mission oriented, requiring stable funding which cannot be achieved through the competitive NRI process. Further, the NRI supports fundamental areas of science which is in contrast to the IR-4's highly focused and applied research.

- (d) An increase of \$1,400,000 for the Pesticide Impact Assessment Special Research Grant (\$1,568,000 available in 1994).

Need for Change. Regulatory reforms resulting from concerns about the impact of pesticides on man and the environment have resulted in an EPA program to reregister all pesticides registered prior to 1985. This EPA special review process examines the data previously submitted in support of those registered uses and determines areas of missing, incomplete or inadequate data. In order to make regulatory decisions, EPA requests data from both public and private sectors. The FIFRA amendments of 1988 have resulted in an acceleration of the rate of EPA special reviews for the reregistration process. In 1991, the Department implemented a new organizational structure for the National Agricultural Pesticide Impact Assessment Program (NAPIAP), which has significantly reduced the response time to EPA with Assessment Reports. That structure has also enabled a more rapid and effective process to generate and collect research data which contributes directly to assessments and to other aspects of reregistration.

Nature of Change. The increased funds will be used to support university scientists on additional assessment teams formed to meet the demands of these FIFRA 88 mandated special reviews. In addition, these funds will be used to support research on innovative methods to assess pesticide impacts. Areas of emphasis would include computer models designed to examine the impacts of various factors on crop yield, quality and profitability, and use of electronic data systems to accelerate the data gathering and enhance the data utilization processes. The assessment team efforts and supporting research will place NAPIAP in a strong position to promote informed regulatory decisions on registered pesticides that significantly benefit U.S. agriculture without causing adverse effects to humans or the environment.

The NAPIAP mandate is to provide specific assessment information on benefits of pest control agents. This must be done rapidly, in a highly focused manner and in highly applied agricultural and environmental settings under this special research grant. The NRI supports very fundamental areas of science and projects which are wide ranging in scope; this competitive process would not allow NAPIAP to be able to perform its functions effectively.

- (e) A decrease of \$43,199,000 for Special Research Grants and \$500,000 for the Critical Agricultural Materials Act.

Need for Change. These grants programs have concentrated on specific problems beyond the normal emphasis in the formula based programs. The Hatch Act and related formula based programs constitute the core of the State-Federal research partnership and, when put together with State funding, provide the basic laboratory facilities, scientists, graduate students, and support necessary for the long term stability of agricultural research. Thus, these formula based programs become the highest priority of the State-Federal research partnership. Selected high priority National interest special research grant programs are proposed for expansion or continuation.

Nature of Change. This change will eliminate this specific funding support for selected grant programs. Due to the discretionary nature of the Hatch Act and related formula based programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility could provide for maintaining some of the programs if the State institutions wish to continue the research. These projects could also be submitted for competition and possible funding under the National Research Initiative.

- (f) An increase of \$1,425,000 for Sustainable Agriculture (\$7,400,000 available in 1994).

Need for Change. Sustainable agriculture is a rapidly emerging concept related to both farming practices and quality of life for farmers and ranchers, members of rural communities, and society as a whole. The Sustainable Agriculture Research and Education Program (SARE) is a major catalyst for the evolution of a philosophy of sustainable development, and facilitator of alternative agricultural systems for the future. In addition to fostering the Administration's commitment to reduce the use of chemical pesticides, SARE research and education projects are designed to reduce fertilizers and toxic materials in agricultural production; improve low-input farm management that enhances agricultural productivity, profitability and competitiveness; promote crop and livestock enterprise diversification; study systems that rely on low-input and conservation practices; use experience and expertise of farmers through direct participation and leadership; transfer practical and timely sustainable agriculture information to farmers; and promote new and meaningful partnerships among farmers, non-profit private organizations, government, academic and agribusiness.

Since 1988, 2,074 SARE (LISA) proposals have been submitted requesting more than \$200 million. Approximately half of the proposals were relevant to sustainable agriculture and of high enough quality to warrant funding. Current SARE resources, however, have limited 1988 through 1992 funding to a total of 309 projects managed through four SARE Regional Administrative Councils, and 31 national initiatives. Because of the long-term nature of many aspects of sustainable agriculture, significant additional resources are required to complete existing projects, interest farmers, researchers and educators in developing and submitting new proposals, and fulfilling the sustainable agriculture mandates of the Food, Agriculture, Conservation, and Trade Act of 1990.

Nature of Change. This funding for SARE will provide essential resources for continuation of support for multi-year farming systems projects that are being conducted on commercial farms and ranches by farmers and ranchers working in meaningful partnerships with public sector researchers, and representatives of non-profit private organizations, agribusiness, and government. This is imperative for the development of alternative agriculture systems for the future.

- (g) A decrease of \$1,818,000 for Supplemental and Alternative Crops (\$1,818,000 available in 1994) consisting of:

-500,000	Crambe/Winter Rapeseed
-668,000	Guayule Research
-500,000	Canola Research
-150,000	Hesperaloe Research
-1,818,000	TOTAL

Need for Change. Prior funding has supported the initial development of these projects. In fiscal year 1995 funds will be directed to Advanced Materials research.

Nature of Change. This change will eliminate specific funding support for earmarked research. Due to the discretionary nature of the Hatch Act and related formula based programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility could provide for maintaining some of the programs if the State institutions wish to continue the research. These projects could also be submitted for competition and possible funding under the National Research Initiative.

- (h) An increase of \$1,818,000 for Advanced Materials under Supplemental and Alternative Crops (no funding available in 1994).

Need for Change. Typically USDA supports intramural and extramural research programs for products and manufacturing processes that use renewable plant and animal materials. Research programs are competitive and mission-oriented and are generally focused on the phase of discovery or invention. A discovery or invention must progress through several additional steps (such as applied research, technology scale-up, demonstration projects) before commercialization by the private sector. In USDA, commercialization assistance is the principal responsibility of the Alternative Agriculture Research and Commercialization (AARC) Center, an entity which brokers end product and market arrangements directly with the private sector. Support for the discovery phase and for commercialization assistance leaves a gap in funding for the necessary intermediate steps. The role CSRS serves is to fill this gap through technology development, accelerating technically sound discoveries by economic/business and institutional analyses, and commercial scale demonstration projects in partnership with business, academia and government. It is a role which capitalizes on research discoveries and, when warranted, progressively removes barriers to commercialization, ultimately taking the industrial product or process to the point of private investment, either alone or in companion to an organization like the AARC Center.

Nature of Change. The AMT for CSRS in 1995 calls for an intense program for uses of vegetable oils that provide materials of strategic and industrial importance. Development of functional fluids from erucic acid oils and derivatives will occur in 1995 with validation and scale-up of technologies, especially for nylon 1313 from brassylic acid. The 1995 program significantly expands available characterization work for hydroxy fatty acid oils and derivatives to develop specific product applications for comparative testing and market assessment. Other vegetable oils and other materials may be added. This comprehensive development program will involve private companies, government and universities in a multi-year partnership that joins resources, facilities and ideas. A successful process will require a management team to establish and evolve a program which progressively removes barriers to commercialization and adjusts work goals and objectives as progress is made.

- (2) An increase of \$17,850,000 for the National Research Initiative (NRI) Competitive Grants Program (\$12,150,000 available in 1994).

Need for Change. Agriculture in the 1990's must provide stewardship of the environment, encourage more rational use of natural resources, improve the quality and nutrient content of food, provide new demand opportunities for agricultural commodities and forest products, and reduce farm program costs in order to continue to benefit producers as well as consumers. This Initiative responds to the major issues facing agriculture such as sustainable agroecosystems, food safety, processing new uses of agricultural products as well as biofuels development, water quality, global climate change, integrated pest management, biological controls, rural development, scientific human capital development, farm income and

market competitiveness. It allows U.S. agriculture to broaden its science and technology base to meet more effectively these demanding needs and exploit new opportunities. These imperatives coincide with recent advances in biology and with other new tools of science that present unique research opportunities for improving agriculture.

Federal funding for the Initiative is necessary because: (1) the problems are national in scope; the nation as a whole is the beneficiary of this effort, not just individual states or industries, (2) the Initiative undertakes research that increases knowledge that will be broadly applicable and that may lead to specific patentable or marketable products, (3) the need is urgent; the issues described below require action now and cannot be delayed or initiated piecemeal, (4) the health and vigor of a major segment of U.S. industry is at stake in terms of international competitiveness and advances in biotechnology provide opportunities for rapid advances in many key areas and (5) there are major benefits that will result from protection of the environment, enhancement of public health, and meeting the needs of consumers and customers of U. S. agricultural products.

The National Research Initiative is designed to conduct fundamental and mission-linked research on agricultural problems. The knowledge developed in concert with base programs will then be made available to American user groups including applied and developmental research laboratories. The intramural programs, nationally focused State Agricultural Experiment Station programs, and the network of public and private universities and organizations are also important in maintaining national thrusts in agricultural research. Extension specialists and researchers supported by the Small Business Innovation Research program have vital roles in this program as participants in research proposals focusing on adaptive research and on the transfer of technology.

A major infusion of new funding is needed to allow the strengths of current research funding mechanisms to do best what each is designed to accomplish. Each mechanism supports the others through a balanced investment in the entire spectrum of agricultural research needs.

This Initiative provides continued support for scientists at land-grant institutions as well as strengthens the USDA intramural program, since USDA scientists are eligible to compete for the grants. It also strengthens the extramural program by extending support to other outstanding scientists outside the realm of traditional agricultural institutions to address national agricultural and natural resource problems.

Nature of Change. Approximately 70 percent of the effort proposed in the NRI supports fundamental research emphasizing the most urgent agricultural, food, and natural resource problems. It is from this research that major conceptual breakthroughs are expected to emerge. These breakthroughs are critical to the eventual solution of complex problems faced by farmers, foresters, ranchers, processors, and consumers. Mission-linked research, also supported by the NRI, is expected to bridge the gap between fundamental and applied research and technology development. Much of the fundamental and mission-linked research will involve multidisciplinary teams.

Funds are awarded on a competitive, peer reviewed basis. This form of funding mechanism is uniquely suited to stimulating new research activity in specific, high-priority areas of agricultural science and engineering. All public and private universities, research organizations, Federal agencies, private organizations or corporations, and individuals are eligible to compete for these funds.

The objectives and 1995 funding requests for the six research components in the Initiative are as follows:

Natural Resources and the Environment (\$27.0 million). Research activities are directed to increase understanding of agriculture and natural resource systems in order to enhance stewardship and encourage protection of the environment. Understanding the effects of potential global climate change on natural resources, agriculture and the environment will be a major area of endeavor. Research will also address the effects of agriculture on water quality by supporting projects that examine underlying mechanisms in order to provide the knowledge necessary to develop methods for water quality protection and enhancement. In addition, research will provide the knowledge base from which integration of mechanistic responses of ecosystems to management planning can be achieved. Knowledge garnered will contribute to generation of biomass for biofuels, as one example. Sustaining agriculture as an environmentally and economically sound enterprise requires improved understanding of the natural resource base upon which agriculture and forestry depend.

Nutrition, Food Safety and Health (\$11.0 million). Human nutrition research is needed to investigate the relationships of human health to diet and nutrition and to food quality and safety. Research is needed on the close relationship between human nutrition and genetics, including specific nutrient and gene interactions, in order to increase our knowledge of the role of nutrition in health maintenance. Further, a better understanding of factors impacting consumer behavior is required, particularly in the areas of obstacles to acceptance of healthful food habits, contemporary eating behaviors and methods to monitor knowledge and attitudes about food and health. There is also a necessity for rapid and reliable methods to detect and quantify pathogenic organisms and naturally occurring toxins in foods in order to determine the potential hazards and approaches needed to ensure food safety.

Plants (\$47.0 million). An increased effort is needed to explain the basic biological processes of crop and forest species, to search for new production systems that are sustainable and to find alternatives for present practices which degrade the environment or are not profitable. An increased effort in fundamental research is also needed to expand the knowledge base for the development and application of biotechnology in agriculture, both as a new industry and for safe, economical use in the food production, processing, and distribution system. The present "reservoir of scientific knowledge" supporting the plant sciences is inadequate for future needs. This knowledge base must be replenished to allow for more environmentally harmonious, economically viable forest and crop production systems. A fundamental understanding of the biology of crop and forest species is prerequisite to sustaining natural and managed systems, devising practices that ensure the compatibility of agricultural practices with the environment, developing sound pest control strategies and moving forward in biotechnology based on scientific principles. A new emphasis on agricultural production systems will foster research on the integration of biological principles with economic and social goals. The plant genome mapping program will continue to be an integral part of the plant systems research category in cooperation with the Agricultural Research Service as the lead agency.

Animals (\$29.5 million). Animal agriculture includes livestock, poultry and the rapidly emerging industries involving aquaculture and non-traditional animals. Research across a wide range of animal sciences is urgently needed for the future sustainability of animal production efficiency as well as to investigate such areas as the modification of animal products. Proposed research will apply advanced research tools including genome mapping and genetic engineering to understand the

mechanisms that control fat and protein deposition, animal disease and reproduction. The knowledge obtained will be applicable for resolution of production and consumer questions. A better definition of the objective indicators of well-being in food-producing animals is needed. A new emphasis on entire agricultural production systems will foster research on the integration of biological principles with economic and social goals.

Processing for Adding Value or Developing New Products (\$9.0 million). This initiative will focus additional resources upon research planned to design or originate new or improved, value-added food, non-food, non-feed products from agricultural and forestry materials. Through the application of the biological and physical sciences, food, non-food and industrial uses will be sought that are safe, energy-efficient, environmentally-sound and economical. Additional basic studies should increase the understanding of the physical, chemical and biological properties of the agricultural materials that may be improved through innovative processing and/or in enhancing and controlling the quality of food and non-food, non-feed products. Presently, only a third of the U.S. agricultural exports are high value-added products. New technology and processes such as bioprocessing present major opportunities for producing goods that will increase the U.S. trade advantage. Energy biomass research on alcohol and biodiesel fuels made from agricultural and forestry feedstocks will be supported. This research represents a priority for U.S. agriculture and should benefit farmers, related industries and consumers.

Markets, Trade, and Rural Development (\$6.5 million). Research is needed to describe and measure the forces that reduce economic vitality and guide the policies that can restore vitality of rural areas. New critical thinking also is needed to provide new theories, concepts, and methodologies for developing rural revitalization policies. U.S. agricultural markets and international trade must be expanded in ways to enhance economic growth and relieve the Federal Government from fiscally burdensome commodity programs. This must be done through a well-coordinated program based on sound scientific principles that will bolster U.S. marketing and trade. Research on the market opportunities and trade implications of new uses for agricultural commodities will also be supported. Research on how to assess new and emerging agricultural technologies will provide valuable insight as new technologies become available.

As shown below, the six NRI categories will have significant impact on programs in the Department's initiatives on water quality, global change, biofuels, food safety, biotechnology, human nutrition, new uses and products, forestry, and pest control by integrated management programs. Emphasis will continue to be placed, where appropriate, on long- and short-term research to insure a sustainable agricultural system.

Funding from NRI for Selected Areas
(Dollars in Thousands)

<u>Crosscut Area</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995 Request</u>
Water Quality	4,629	4,370	8,370	9,870
Global Change	9,400	9,218	10,450	10,450
Food Safety	3,440	3,973	4,352	5,500
Human Nutrition	3,826	3,705	4,826	5,500
Plant Genome	12,309	12,196	13,000	13,300

<u>Crosscut Area</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995 Request</u>
Biofuels	500	809	800	900
Biotechnology	38,152	36,516	37,347	41,916
New and Improved Uses	6,053	4,788	6,788	7,538
Forestry	9,508	6,340	9,508	10,000
Integrated Pest Management	3,827	4,148	5,648	6,000
Biological Control	3,250	4,809	7,209	7,500
Advanced Manufacturing	939	2,637	3,357	3,607
Advanced Materials	1,690	970	1,690	1,690
Wetlands	1,299	557	1,299	1,299
Sustainable Agriculture*	10,640	10,142	13,000	14,000

*The funds designated as sustainable agriculture were categorized as either site-specific or identifiable as impacting directly on the objectives of sustainable agriculture. A high percentage of NRI funds supports research that will contribute to a sustainable agricultural system on a long-term basis.

The NRI is strongly supported by the Administration as well as numerous producer and trade associations and advisory groups. It has also attracted the strong support of the scientific community throughout the United States. The NRI is of major importance to the future of American agriculture and has been a successful mechanism to increase the investment in agriculture research in recent years as well as enhancing the general quality of the research. Congress has fully endorsed the NRI in the 1990 Farm Bill and with funding increases without earmarking.

- (3) A net decrease of \$10,764,000 for Federal Administration (direct appropriation) (\$22,655,000 available in 1994) consisting of:
- (a) A decrease of \$9,103,000 for the following projects (\$9,103,000 available in 1994):
- | | |
|------------|---|
| -3,500,000 | Gulf Coast shrimp aquaculture |
| -668,000 | Curriculum development and strengthening, Mississippi Valley State University |
| -750,000 | Center for Agricultural and Rural Development, Iowa |
| -1,075,000 | Geographic information system pilot program |
| -500,000 | Vocational aquaculture education curriculum |
| -613,000 | Herd management program, Tennessee State University |
| -250,000 | Alternative Fuels Characterization Lab, University of North Dakota |
| -100,000 | Center for North American Studies |
| -1,000,000 | PM-10 Study |
| -647,000 | Agricultural development in the American Pacific |
| -9,103,000 | TOTAL |

Prior funding has supported the initial development of these projects. Emphasis is placed on high priority national interest programs in the 1995 CSRS budget.

- (b) A decrease of \$1,250,000 for water quality research in Illinois and North Dakota. Prior funding has supported the initial development of these projects. Funding is requested for water quality under the Special Research Grants program as part of the Federal government's water quality initiative. Water quality research is also conducted through the National Research Initiative Competitive Grants program and States may compete for these funds.
- (c) A decrease of \$208,000 for the Agriculture in the Classroom program (\$208,000 available in 1994). Management of this program has now been assigned to the Extension Service which is including this program in their 1995 budget request.
- (d) An increase of \$240,000 for peer panel costs (\$260,000 available through direct Federal administration in 1994). Cooperative State Research Service uses the peer panel review process to evaluate proposals submitted under the National Research Initiative, Special Research Grants program, Higher Education programs, Rangeland Research program, and the Small Business Innovation Research program. This request provides for the cost of travel and honoraria for the peer panel members. Additional peer panel costs are met through set-asides from program funds. Growth in the CSRS grants programs results in the need for more peer panels, and these additional funds are needed for the increased costs associated with travel and honoraria for the peer panelists.
- (e) An increase of \$125,000 which reflects the fiscal year 1995 pay raise.
- (f) A decrease of \$226,000 for the Office of Grants and Program Systems. (\$334,000 available in 1994).

Need for Change. In support of the President's Executive Order to promote the efficient use of resources for administrative purposes, USDA is committed to reducing administrative costs.

Nature of Change. In order to achieve this savings, CSRS will carefully monitor supply and equipment purchases, printing and reproduction costs and travel costs.

- (g) A decrease of \$294,000 for a reduction in Federal employment costs.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order mandating a reduction in Federal employment, CSRS is not filling five personnel positions.

Nature of Change. To achieve the reduction, CSRS will streamline its operations. The total reduction in personnel costs amounts to \$294,000.

- (h) A decrease of \$48,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$48,000.

Nature of Change. In order to achieve these savings, CSRS will reduce discretionary expenses by \$48,000 in FY 1995, in areas such as supply and equipment purchases, printing and reproduction costs and travel costs.

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

The Small Business Innovation Development Act (SBIR), Public Law 97-219, July 22, 1982, as amended by Public Law 99-443, October 6, 1986, was designed to strengthen the role of small, innovative firms in Federally funded research and development. Under this program small firms receive at least a fixed minimum percentage of research and development awards made by Federal agencies with sizable research and development budgets. From FY 1986 through FY 1992, 1.25 percent of an agency's extramural research budget was set aside for purposes of the SBIR Act. The Small Business Research and Development Enhancement Act of 1992 (Public Law 102-564, October 28, 1992) has amended the set-aside percent for the SBIR program as follows: 1.5 percent in fiscal years 1993 and 1994, 2.0 percent in fiscal years 1995 and 1996, and 2.5 percent in each fiscal year thereafter.

<u>Agency</u>	<u>FY 1993 Actual</u>	<u>FY 1994 Estimate</u>	<u>FY 1995 Estimate</u>
Agricultural Research Service	\$486,595	\$426,000	\$578,000
Alternative Agricultural Research and Commercialization	92,438	114,750	153,000
Cooperative State Research Service	6,045,841	6,370,263	7,846,739
Economic Research Service	15,000	16,500	22,000
Forest Service	444,000	404,670	539,560
Human Nutrition Information Service	6,630	3,041	10,000
National Agricultural Statistics Service	2,400	2,250	3,000
Office of International Cooperation and Development	<u>2,393</u>	<u>1,781</u>	<u>2,374</u>
Total	7,095,297	7,339,255	9,154,673

The functions of the SBIR program (solicitation, review and evaluation of proposals) have been centralized in order to most effectively and efficiently serve the SBIR community. Eight research topic areas have been established:

1. Forests and Related Resources. Research proposals are solicited to develop environmentally sound techniques to increase productivity of forest land and to increase the utilization of materials and resources from forest lands.
2. Plant Production and Protection. Research proposals are solicited to examine means of enhancing crop production by reducing the impact of destructive agents, developing effective crop systems that are economically and environmentally sound, enhancing the impact of new methods of plant manipulation, and developing new crop plants and new uses for existing crops.
3. Animal Production and Protection. Research proposals are solicited to find ways to enable producers of food animals to increase production efficiency and to assure a reliable and safe supply of animal protein and other animal products while conserving resources and reducing production costs.
4. Air, Water and Soils. Research proposals are solicited to develop technologies for conserving air, water and soil resources while sustaining agricultural productivity.
5. Food Science and Nutrition. Research proposals are solicited to develop new knowledge and a better understanding of the characteristics of foods and their nutritional impact; to apply new knowledge to improve our foods and diets; and to apply new knowledge to the

production of useful new food products, processes, materials, and systems including application of nutritional information to consumer foods and food service systems.

6. Rural and Community Development. Research proposals are solicited to promote, foster, or improve the well-being of rural Americans.

7. Aquaculture. Research proposals are solicited to enhance the knowledge and technology base necessary for the continued growth of the domestic aquaculture industry as a form of production agriculture. Emphasis is placed on research leading to improved production efficiency and increased competitiveness of private sector aquaculture in the United States.

8. Industrial Applications. Research proposals are solicited to develop new or improved technologies that will lead to increased production of industrial products from agricultural materials.

TABLE 1
DISTRIBUTION OF FEDERAL PAYMENTS FOR RESEARCH AND EDUCATION AT STATE AGRICULTURAL EXPERIMENT
STATIONS AND OTHER STATE INSTITUTIONS - FISCAL YEAR 1993

STATE	MATCH ACT AS MEDDED		COOPERATIVE FORESTRY RESEARCH (MS)	1890 COLLEGES & TUSSKEGEE UNIV. (EA)	ANNUAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	MRI COMPETITIVE GRANTS	HIGHER EDUCATION GRANTS	FEDERAL ADMIN. DIRECT APPROP.	FACILITIES	BIOTECH. RISK ASSESS.	TOTAL FEDERAL FUNDS
	REGULAR FORMULA	REGIONAL FORMULA										
ALABAMA	2,826,499	787,391	3,614,400	3,033,500	116,054	839,282	781,022	50,000	1,969,342	0	\$61,500	11,051,028
ALASKA	768,262	134,170	902,432	0	6,778	5,000	149,892	50,000	0	0	0	1,470,924
AMERICAN SAMOA	638,711	201,368	659,079	0	0	0	0	50,000	0	0	0	709,079
ARIZONA	1,062,693	690,420	1,772,120	1,338,947	48,900	304,180	1,608,820	50,000	0	1,057,000	0	5,104,740
ARKANSAS	2,438,567	709,527	482,829	83,394	83,394	2,866,589	1,012,676	50,000	343,480	3,093,330	100,000	12,699,730
CALIFORNIA	3,216,590	1,462,700	4,678,860	455,244	455,244	3,634,022	9,597,025	544,587	0	2,498,720	61,500	22,221,519
COLORADO	1,440,562	1,019,796	2,460,358	304,402	304,402	2,308,725	1,495,065	222,568	0	0	72,000	7,128,293
CONNECTICUT	1,204,394	71,669	1,669,141	207,897	17,969	512,672	1,514,862	98,278	0	0	0	4,020,819
DELAWARE	832,742	347,660	1,180,392	93,343	518,262	5,000	650,490	50,000	559,669	0	0	3,078,213
DIST. OF COLUMBIA	418,220	100,368	518,588	0	21,057	5,000	323,920	50,000	0	0	0	897,508
FLORIDA	2,080,948	626,337	2,665,285	494,284	132,170	2,289,531	2,866,834	334,000	975,112	1,807,110	0	10,857,827
GEOORGIA	3,180,392	1,090,102	4,270,494	608,839	141,631	3,029,558	2,980,107	50,000	297,500	0	0	14,886,783
HAWAII	664,669	114,885	779,554	36,066	0	284,100	0	50,000	0	0	0	1,149,720
IDAH	823,159	359,745	1,182,904	127,710	7,466	2,934,647	439,378	50,000	2,505,381	3,211,670	0	10,459,156
ILLINOIS	1,356,434	559,325	1,914,956	301,996	48,693	1,289,729	971,559	50,000	0	485,000	123,000	5,285,578
IOWA	4,054,631	917,611	5,002,045	30,996	149,716	7772,708	3,503,302	283,950	716,587	501,490	61,500	11,301,794
KANSAS	3,713,408	813,646	4,527,054	322,452	84,060	3,293,750	2,095,051	180,000	0	2,090,350	122,560	12,715,677
MARYLAND	1,891,881	1,486,631	3,378,348	196,442	248,837	3,680,222	2,068,755	342,000	716,587	0	61,500	14,692,639
MASSACHUSETTS	2,853,368	734,254	3,097,622	162,076	191,687	1,286,447	1,191,560	114,475	0	1,312,410	0	7,291,802
MICHIGAN	3,724,287	789,007	4,523,294	368,274	79,247	316,860	1,039,558	114,475	878,559	0	0	9,281,394
MINNESOTA	2,251,559	651,788	2,903,347	528,650	100,916	1,327,928	1,218,634	94,279	373,600	7,765,668	0	7,765,668
MISSISSIPPI	1,630,116	486,433	2,106,549	240,106	20,783	1,393,230	388,940	50,000	0	752,720	0	4,813,312
MISSOURI	3,529,813	748,671	4,278,484	345,363	811,123	3,813,230	2,182,726	50,000	677,564	886,140	0	7,973,575
MONTANA	1,278,277	626,409	1,905,136	391,185	71,143	423,342	727,509	50,000	0	0	0	5,944,042
NEBRASKA	2,189,919	849,583	3,039,502	139,165	203,572	2,684,542	1,337,408	266,000	0	14,559,700	0	29,012,814
NEVADA	761,418	342,975	1,104,393	58,977	23,720	193,833	220,052	50,000	0	0	0	360,025
NH HAMPSHIRE	958,289	348,377	1,306,666	288,086	8,588	131,000	557,459	50,000	0	208,550	0	1,899,525
NJ JERSEY	1,399,913	1,186,418	2,586,331	713,532	18,811	912,652	704,816	158,000	0	2,544,310	0	2,341,759
NH HAWAII	1,094,847	377,357	1,472,204	219,353	39,460	1,231,654	404,013	165,000	0	0	0	1,899,525
NH NEW YORK	3,559,665	1,429,085	5,018,740	597,383	235,351	2,894,140	6,692,128	365,527	0	3,586,090	0	3,546,694
NH NORTH CAROLINA	4,800,867	1,193,884	5,900,708	563,017	101,221	518,704	3,101,278	348,520	1,008,678	3,573,480	0	19,379,359
NH NORTH DAKOTA	1,616,077	564,147	2,180,224	70,433	0	2,916,137	1,351,011	50,000	1,097,807	4,339,780	0	17,595,300
NH MARYLAND	512,959	0	512,959	0	0	0	0	50,000	0	0	0	12,057,540
NH MARYLAND	512,959	0	512,959	0	0	0	0	50,000	0	0	0	562,959

TABLE 1
DISTRIBUTION OF FEDERAL PAYMENTS FOR RESEARCH AND EDUCATION AT STATE AGRICULTURAL EXPERIMENT
STATIONS AND OTHER STATE INSTITUTIONS - FISCAL YEAR 1993

STATE	REGULAR FORMULA	HATCH ACT AS AVOIDED REGIONAL FORMULA	TOTAL	COOPERATIVE FORESTRY RESEARCH (NS)	1890 COLLEGES & TUSSGEE UNIV. (GA)	ANIMAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	NRI COMPETITIVE GRANTS	HIGHER EDUCATION GRANTS	FEDERAL ADMIN. DIRECT APPROP.	FACILITIES	BIOTECH. RISK ASSESS.	TOTAL FEDERAL FUNDS
OHIO	4,424,216	908,209	5,332,425	333,908	1,244,590	0	1,893,234	2,094,825	50,000	0	496,640	0	10,311,958
OKLAHOMA	2,250,974	566,581	2,817,555	299,542	1,244,590	0	142,627	992,676	358,000	834,282	0	0	7,322,431
OREGON	1,692,812	887,205	2,580,017	631,749	0	96,015	3,239,997	1,439,341	396,000	0	1,769,280	0	10,152,399
PENNSYLVANIA	4,392,572	1,186,332	5,568,904	448,462	0	140,136	2,004,312	4,543,712	158,000	0	0	0	12,863,526
PUERTO RICO	3,080,436	701,585	3,782,021	81,888	0	12,870	375,188	0	50,000	0	0	0	4,238,967
RHODE ISLAND	763,157	360,739	1,123,896	116,254	0	6,275	302,308	484,318	50,000	296,301	0	0	2,083,051
SOUTH CAROLINA	2,465,911	650,682	3,106,593	469,918	1,318,077	26,051	570,265	851,301	50,000	0	0	0	6,740,006
SOUTH DAKOTA	1,663,667	588,952	2,252,619	104,799	0	99,581	73,364	529,453	50,000	0	848,750	0	3,938,566
TENNESSEE	3,563,799	806,712	4,370,511	414,096	1,864,668	64,278	392,064	874,783	50,000	792,991	1,129,080	0	9,952,481
TEXAS	4,651,424	1,147,546	5,798,970	471,374	2,449,119	410,628	1,888,485	6,224,835	343,393	467,536	638,260	0	18,639,250
UTAH	961,667	646,534	1,608,201	150,621	0	56,858	310,948	460,000	117,965	0	0	0	3,342,873
VERMONT	1,013,031	305,467	1,318,498	276,631	0	13,282	1,732,619	618,070	50,000	0	0	0	4,009,100
VIRGIN ISLANDS	660,670	112,874	763,544	47,522	0	0	204,688	0	50,000	0	0	0	1,065,754
VIRGINIA	3,041,278	744,103	3,785,381	517,195	1,602,867	84,628	315,371	1,192,761	178,683	1,593,403	863,600	0	10,123,889
WASHINGTON	1,928,738	1,370,404	3,299,142	620,284	0	174,484	3,523,294	2,295,747	50,000	0	2,190,260	0	12,733,221
WEST VIRGINIA	1,920,701	507,655	2,428,356	379,730	0	11,950	60,996	910,502	50,000	0	0	0	3,841,534
WISCONSIN	3,683,141	948,927	4,632,068	425,951	0	178,784	988,419	4,947,800	230,480	0	2,179,590	0	13,457,722
WORKING	904,626	499,789	1,404,415	184,987	38,100	38,629	79,104	579,429	50,000	0	418,070	0	2,754,634
OTHER	215,700	215,700	431,400	0	0	0	488,751	0	0	185,514	0	0	742,551
SBIR	1,867,121	592,235	2,459,356	269,665	398,670	79,934	1,248,712	1,404,000	0	0	0	0	6,045,841
SUBTOTAL	\$124,336,376	\$39,438,105	\$163,773,481	\$17,966,770	\$26,557,800	\$5,310,790	\$83,139,990	\$93,218,480	\$7,700,000	\$18,467,490	\$58,644,260	\$725,460	\$475,504,521
UNBOLICATED BAL.	0	0	0	0	0	0	0	0	0	0	8,104,350	0	8,104,350
SUBTOTAL	\$124,336,376	\$39,438,105	\$163,773,481	\$17,966,770	\$26,557,800	\$5,310,790	\$83,139,990	\$93,218,480	\$7,700,000	\$18,467,490	\$66,748,610	\$725,460	\$483,608,871
FEDERAL ADMIN. UNBOLICATED BAL.	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
BIOTECHNOLOGY RISK ASSESSMENT	139,372	44,208	183,580	10,240	20,200	18,170	107,530	381,520	0	4,220	0	0	0
TOTAL	\$124,474,748	\$39,482,313	\$163,957,061	\$18,033,000	\$27,400,000	\$5,551,000	\$86,579,000	\$97,500,000	\$7,850,000	\$20,795,000	\$69,073,000	\$0	\$502,066,000

Table 2
Payments to State Agricultural Experiment Stations under the Hatch Act

State	FY 1993 Actual			FY 1994 Estimate			FY 1995 Estimate		
	Regular Formula	Regional Research	Total	Regular Formula	Regional Research	Total	Regular Formula	Regional Research (a)	Total
Alabama	\$2,826,499	\$787,901	\$3,614,400	\$2,849,750	\$784,137	\$3,633,887	\$2,835,267	\$782,322	\$3,617,589
Alaska	768,262	134,170	902,432	775,312	134,979	910,291	771,371	134,667	906,038
American Samoa	638,711	20,368	659,079	647,744	20,490	668,234	644,453	20,443	664,896
Arizona	1,062,693	709,427	1,772,120	1,072,151	713,704	1,785,855	1,066,702	712,052	1,778,754
Arkansas	2,438,967	690,520	3,129,487	2,458,685	687,221	3,145,906	2,446,189	685,631	3,131,820
California	3,216,590	1,462,270	4,678,860	3,255,719	1,470,906	4,726,625	3,239,172	1,467,502	4,706,674
Colorado	1,440,562	1,019,796	2,460,358	1,455,485	1,026,616	2,482,101	1,448,088	1,024,240	2,472,328
Connecticut	1,204,394	464,747	1,669,141	1,215,370	467,641	1,683,011	1,209,193	466,559	1,675,752
Delaware	832,742	347,650	1,180,392	840,329	349,814	1,190,143	836,059	349,005	1,185,064
Dist. of Col.	418,220	100,368	518,588	527,665	100,994	628,659	524,984	100,760	625,744
Florida	2,038,948	626,337	2,665,285	2,063,880	638,345	2,702,225	2,053,392	636,868	2,690,260
Georgia	3,180,392	1,090,102	4,270,494	3,211,231	1,077,398	4,288,629	3,194,912	1,074,905	4,269,817
Guam	664,669	114,886	779,554	671,132	115,577	786,709	667,721	115,310	783,031
Hawaii	823,159	359,745	1,182,904	830,525	361,914	1,192,439	826,304	361,077	1,187,381
Idaho	1,355,631	559,325	1,914,956	1,369,108	562,697	1,931,805	1,362,151	561,395	1,923,546
Illinois	4,054,434	947,611	5,002,045	4,094,873	953,072	5,047,945	4,074,062	950,867	5,024,929
Indiana	3,713,408	831,646	4,545,054	3,753,397	833,249	4,586,646	3,734,322	831,390	4,565,712
Iowa	3,891,831	1,486,517	5,378,348	3,933,014	1,584,054	5,517,068	3,913,027	1,580,388	5,493,415
Kansas	2,363,368	734,254	3,097,622	2,385,784	738,486	3,124,270	2,373,660	736,777	3,110,437
Kentucky	3,734,287	789,007	4,523,294	3,771,947	785,238	4,557,185	3,752,779	783,421	4,536,200
Louisiana	2,251,559	651,788	2,903,347	2,270,955	648,674	2,919,629	2,259,413	647,173	2,906,586
Maine	1,181,100	486,433	1,667,533	1,192,749	487,400	1,680,149	1,186,688	486,272	1,672,960
Maryland	1,630,116	609,477	2,239,593	1,645,657	613,273	2,258,930	1,637,293	611,854	2,249,147
Massachusetts	1,423,534	594,931	2,018,465	1,436,896	598,636	2,035,532	1,429,594	597,251	2,026,845
Michigan	3,727,169	840,933	4,568,102	3,765,080	915,779	4,680,859	3,745,945	913,660	4,659,605
Minnesota	310,025	0	310,025	682,925	0	682,925	679,454	0	679,454
Mississippi	3,649,272	838,051	4,487,323	3,686,759	842,880	4,529,639	3,668,022	840,930	4,508,952
Missouri	2,910,409	796,752	3,707,161	2,931,599	792,946	3,724,545	2,916,700	791,111	3,707,811
Montana	3,529,813	748,671	4,278,484	3,565,874	752,987	4,318,861	3,547,753	751,245	4,298,998
Nebraska	1,278,727	626,409	1,905,136	1,292,402	630,187	1,922,589	1,285,833	628,729	1,914,562
Nevada	2,189,919	849,583	3,039,502	2,212,137	854,479	3,066,616	2,200,895	852,502	3,053,397
New Hampshire	761,418	342,975	1,104,393	768,636	345,042	1,113,678	764,730	344,244	1,108,974
New Jersey	958,289	348,377	1,306,666	968,373	350,547	1,318,920	963,451	349,736	1,313,187
New Mexico	1,399,913	1,186,418	2,586,331	1,413,376	1,197,999	2,611,375	1,406,193	1,195,227	2,601,420
New York	1,094,847	377,357	1,472,204	1,105,078	379,632	1,484,710	1,099,462	378,754	1,478,216
North Carolina	3,559,665	1,459,085	5,018,750	3,593,849	1,449,259	5,043,108	3,575,584	1,445,905	5,021,489
North Dakota	4,800,867	1,129,841	5,930,708	4,841,546	1,124,444	5,965,990	4,816,942	1,121,842	5,938,784
N. Mariana	1,616,077	564,147	2,180,224	1,629,919	567,398	2,197,317	1,621,635	566,085	2,187,720
Ohio	512,959	0	512,959	634,696	0	634,696	631,470	0	631,470
Oklahoma	4,424,216	908,209	5,332,425	4,472,096	913,442	5,385,538	4,449,368	911,328	5,360,696
Oregon	2,250,974	566,581	2,817,555	2,272,551	581,774	2,854,325	2,261,002	580,428	2,841,430
Pennsylvania	1,692,812	887,205	2,580,017	1,712,738	892,554	2,605,292	1,704,035	890,488	2,594,523
Rhode Island	4,382,572	1,186,332	5,568,904	4,427,214	1,194,402	5,621,256	4,404,715	1,191,278	5,595,993
South Carolina	3,087,436	701,585	3,789,021	3,101,403	698,233	3,799,636	3,085,641	696,617	3,782,258
South Dakota	763,157	360,739	1,123,896	769,922	362,986	1,132,908	766,009	362,146	1,128,155
Tennessee	2,455,911	650,682	3,106,593	2,478,509	647,574	3,126,083	2,465,914	646,075	3,111,989
Texas	1,663,667	568,952	2,232,619	1,680,149	572,232	2,252,381	1,671,609	570,909	2,242,518
Utah	3,563,799	806,712	4,370,511	3,594,569	802,859	4,397,428	3,576,301	801,001	4,377,302
Vermont	4,651,424	1,147,546	5,798,970	4,702,081	1,325,064	6,027,145	4,678,185	1,321,997	6,000,182
Virgin Islands	961,667	646,534	1,608,201	970,117	710,432	1,680,549	965,187	708,789	1,673,976
Virginia	1,013,031	305,467	1,318,498	1,022,603	307,370	1,329,973	1,017,407	306,859	1,324,066
Washington	650,670	112,874	763,544	656,798	112,335	769,133	653,460	112,076	765,536
West Virginia	3,041,278	744,103	3,785,381	3,069,125	734,576	3,803,701	3,053,527	732,876	3,786,403
Wisconsin	1,928,738	1,370,404	3,299,142	1,949,262	1,382,306	3,331,568	1,939,354	1,379,108	3,318,462
Wyoming	1,920,701	507,655	2,428,356	1,937,110	510,817	2,447,927	1,927,265	509,636	2,436,901
Other	3,658,141	948,927	4,607,068	3,697,276	955,781	4,653,057	3,678,485	953,568	4,632,053
Subtotal	904,626	495,789	1,400,415	913,291	502,802	1,416,093	908,649	501,635	1,410,284
Federal Admin.	0	215,700	215,700	0	218,900	218,900	0	218,900	218,900
Unoblig. Bal.	0	0	0	0	0	0	0	0	0
SBR set-aside	1,867,121	592,235	2,459,356	1,894,326	601,681	2,496,007	2,525,769	802,241	3,328,010
Biotech. Risk	0	0	0	0	0	0	0	0	0
Assessment	139,372	44,208	183,580	145,681	46,209	191,890	145,681	46,209	191,890
Contingency	0	0	0	0	110,000	110,000	0	0	0
TOTAL	124,474,748	39,482,313	163,957,061	126,288,426	40,112,063	171,300,000	126,288,428	40,112,063	171,300,000

(a) Final distribution will be determined at a later date by a statutory committee authorized in the Hatch Act.

Table 3
Distribution of Funds under the McIntire-Stennis Cooperative
Forestry Research Act
(In Dollars)

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Estimate	Fiscal Year 1995 Estimate
ALABAMA			
Agricultural Experiment Station, Auburn University	\$585,928	\$660,370	\$657,016
ALASKA			
Agricultural Experiment Station, University of Alaska	356,819	439,801	450,476
AMERICAN SAMOA			
American Samoa Community College	0	0	0
ARIZONA			
Agricultural Experiment Station, University of Arizona	126,860	142,052	141,331
School of Forestry, Northern Arizona University	126,860	142,052	141,331
ARKANSAS			
Agricultural Experiment Station, Univ. of Arkansas	482,829	582,522	579,564
CALIFORNIA			
Agricultural Experiment Station, Univ. of California	441,249	497,157	494,632
Department of Forestry, California State Univ., Humboldt	82,734	93,217	92,743
California Polytechnic State University	27,578	31,072	30,914
COLORADO			
College of Forestry and Natural Resources, Colorado State Univ.	265,175	310,054	308,479
CONNECTICUT			
Agricultural Experiment Station, New Haven	155,923	164,425	163,589
Agricultural Experiment Station, Univ. of Connecticut, Storrs ..	51,974	54,808	54,530
DELAWARE			
Agricultural Experiment Station, University of Delaware	93,343	89,485	89,030
FLORIDA			
Agricultural Experiment Station, University of Florida	494,284	595,497	592,472
GEORGIA			
School of Forest Resources, University of Georgia	608,839	712,269	708,651
GUAM			
Agricultural Experiment Station, University of Guam	36,066	37,586	37,395
HAWAII			
Agricultural Experiment Station, University of Hawaii	127,710	141,384	140,666
IDAHO			
College of Forestry, University of Idaho	402,641	426,826	424,658
ILLINOIS			
Agricultural Experiment Station, University of Illinois	155,498	168,002	167,149
Department of Forestry, Southern Illinois University	155,498	168,002	167,149
INDIANA			
Agricultural Experiment Station, Purdue University	322,452	348,978	347,206
IOWA			
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	196,442	232,206	231,027
KANSAS			
Agricultural Experiment Station, Kansas State University	162,076	180,308	179,392
KENTUCKY			
Agricultural Experiment Station, University of Kentucky	368,274	400,877	398,841
LOUISIANA			
Agricultural Experiment Station, Louisiana State University ...	370,055	425,930	423,767
School of Forestry, Louisiana Tech University	158,595	182,541	181,614
MAINE			
Agricultural Experiment Station, University of Maine	540,106	569,547	553,746
MARYLAND			
Agricultural Experiment Station, University of Maryland	242,264	271,130	269,753
MASSACHUSETTS			
Agricultural Experiment Station, University of Massachusetts ..	230,809	258,156	256,844

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Estimate	Fiscal Year 1995 Estimate
MICHIGAN			
Agricultural Experiment Station, Michigan State University	\$168,580	\$176,874	\$175,976
School of Natural Resources, University of Michigan	168,580	176,874	175,976
Department of Forestry, Michigan Technological University	168,580	176,874	175,976
MICRONESIA			
College of Micronesia	0	0	0
MINNESOTA			
Agricultural Experiment Station, University of Minnesota	437,007	504,674	502,111
MISSISSIPPI			
School of Forest Resources, Mississippi State University	574,472	647,395	644,107
MISSOURI			
Agricultural Experiment Station, University of Missouri	345,363	426,826	437,567
MONTANA			
School of Forestry, University of Montana	391,185	413,852	411,750
NEBRASKA			
Agricultural Experiment Station, University of Nebraska	139,165	167,333	166,483
NEVADA			
Agricultural Experiment Station, University of Nevada	58,977	63,536	63,213
NEW HAMPSHIRE			
Agricultural Experiment Station, University of New Hampshire ..	288,086	323,029	321,388
NEW JERSEY			
Agricultural Experiment Station, Rutgers University	173,532	193,282	192,301
NEW MEXICO			
Agricultural Experiment Station, New Mexico State University ..	219,353	245,181	243,936
NEW YORK			
Agricultural Experiment Station, Cornell University	149,346	168,336	167,481
College of Environmental Science and Forestry, State University of New York	448,037	505,009	502,444
NORTH CAROLINA			
School of Forest Resources, North Carolina State University ...	563,017	673,345	682,834
NORTH DAKOTA			
Agricultural Experiment Station, North Dakota State University	70,433	76,510	76,122
OHIO			
Agricultural Experiment Station, Ohio State University	333,908	374,928	373,023
OKLAHOMA			
Agricultural Experiment Station, Oklahoma State University	299,542	361,953	360,115
OREGON			
School of Forestry, Oregon State University	631,749	699,294	695,742
PENNSYLVANIA			
Agricultural Experiment Station, Pennsylvania State University	448,462	491,699	489,202
PUERTO RICO			
Agricultural Experiment Station, University of Puerto Rico	81,888	102,460	101,939
RHODE ISLAND			
Agricultural Experiment Station, University of Rhode Island ...	116,254	115,434	114,848
SOUTH CAROLINA			
College of Forest and Recreation Resources, Clemson University	459,918	517,649	515,020
SOUTH DAKOTA			
Agricultural Experiment Station, South Dakota State University	104,799	128,409	127,757
TENNESSEE			
Agricultural Experiment Station, University of Tennessee	414,096	465,750	463,385
TEXAS			
Agricultural Experiment Station, Texas A&M University	235,687	271,799	270,419
School of Forestry, Stephen F. Austin State University	235,687	271,799	270,419
UTAH			
College of Natural Resources, Utah State University	150,621	154,358	153,574
VERMONT			
School of Natural Resources, University of Vermont	276,631	297,080	295,571
VIRGIN ISLANDS			
Agricultural Experiment Station, Univ. of the Virgin Islands ..	47,522	50,561	50,304

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Estimate	Fiscal Year 1995 Estimate
VIRGINIA			
School of Forestry and Wildlife Resources.			
Virginia Polytechnic Institute and State University	\$517,195	\$569,547	\$566,655
WASHINGTON			
Agricultural Experiment Station, Washington State University ..	279,132	297,167	284,039
College of Forest Resources, University of Washington	341,162	363,204	347,159
WEST VIRGINIA			
Agricultural Experiment Station, West Virginia University	379,730	387,902	385,932
WISCONSIN			
Agricultural Experiment Station, University of Wisconsin	425,551	478,725	476,293
WYOMING			
Agricultural Experiment Station, University of Wyoming	184,987	206,257	205,209
Subtotal	17,697,115	19,871,159	19,770,235
Federal administration (3%)	555,990	624,270	624,270
Small Business Act	269,655	302,771	403,695
Biotechnology Risk Assessment	10,240	10,800	10,800
Total	<u>18,533,000</u>	<u>20,809,000</u>	<u>20,809,000</u>

Table 4

Evans-Allen Payments to 1890 Colleges and Tuskegee University
Under Section 1445, Public Law 95-113, As Amended
(In Dollars)

State/Institution	Fiscal Year 1993 Actual	Fiscal Year 1994 Estimate	Fiscal Year 1995 Estimate
ALABAMA			
Alabama A&M University	\$1,526,433	\$1,562,889	\$1,554,939
Tuskegee University	1,507,067	1,543,523	1,535,672
ARKANSAS			
University of Arkansas--Pine Bluff..	1,338,947	1,371,270	1,364,295
DELAWARE			
Delaware State College	518,262	529,856	527,162
FLORIDA			
Florida A&M University	1,100,611	1,138,295	1,132,502
GEORGIA			
Fort Valley State College	1,701,544	1,750,003	1,741,098
KENTUCKY			
Kentucky State University	1,961,127	2,022,380	2,012,089
LOUISIANA			
Southern University	1,218,314	1,248,362	1,242,011
MARYLAND			
University of Maryland-Eastern Shore	896,407	920,371	915,689
MISSISSIPPI			
Alcorn State University	1,554,136	1,587,583	1,579,509
MISSOURI			
Lincoln University	1,869,177	1,930,086	1,920,264
NORTH CAROLINA			
North Carolina A&T State University.	2,449,694	2,514,745	2,501,951
OKLAHOMA			
Langston University	1,244,590	1,280,001	1,273,488
SOUTH CAROLINA			
South Carolina State College.....	1,318,077	1,352,033	1,345,156
TENNESSEE			
Tennessee State University	1,864,658	1,914,798	1,905,057
TEXAS			
Prairie View A&M College	2,449,119	2,529,800	2,516,925
VIRGINIA			
Virginia State College	1,602,867	1,646,481	1,638,107
CRIS	38,100	38,600	38,600
Subtotal	26,159,130	26,881,076	26,744,514
Federal Administration (3%)	822,000	844,710	844,710
Small Business Set-Aside	398,670	409,684	546,246
Biotechnology Risk Assessment	20,200	21,530	21,530
TOTAL	27,400,000	28,157,000	28,157,000

Table 5
Distribution of Funds for Animal Health and Disease Research
Section 1433, P.L. 95-113
(In Dollars)

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Est.	Fiscal Year 1995 Est.
ALABAMA			
Agricultural Experiment Station, Auburn University	\$45,786	\$48,281	\$48,035
School of Veterinary Medicine, Auburn University	68,300	65,358	65,025
School of Veterinary Medicine, Tuskegee University	1,968	1,415	1,408
ALASKA			
Agricultural Experiment Station, University of Alaska	6,778	7,309	7,272
ARIZONA			
Agricultural Experiment Station, University of Arizona	48,900	50,090	49,835
ARKANSAS			
Agricultural Experiment Station, University of Arkansas	83,394	85,725	85,288
CALIFORNIA			
Agricultural Experiment Station, Univ. of California, Oakland .	192,383	187,147	186,194
School of Veterinary Medicine, University of California, Davis.	262,861	291,796	290,310
COLORADO			
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University	304,402	281,169	279,737
CONNECTICUT			
Agricultural Experiment Station, Univ. of Connecticut, Storrs .	17,969	17,523	17,434
DELAWARE			
Agricultural Experiment Station, University of Delaware	21,057	19,919	19,818
FLORIDA			
Agricultural Experiment Station, University of Florida	51,269	92,130	91,661
College of Veterinary Medicine, University of Florida	80,901	47,163	46,923
GEORGIA			
Agricultural Experiment Station, University of Georgia	19,337	16,285	16,202
College of Veterinary Medicine, University of Georgia	122,294	122,222	121,599
HAWAII			
Agricultural Experiment Station, University of Hawaii	7,466	7,560	7,521
IDAHO			
Agricultural Experiment Station, University of Idaho	48,693	49,950	49,696
ILLINOIS			
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois	149,716	161,287	160,465
INDIANA			
Agricultural Experiment Station and College of Veterinary Medicine, Purdue University	84,060	87,092	86,648
IOWA			
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	42,365	42,232	42,017
College of Veterinary Medicine, Iowa State University	206,472	204,213	203,173
KANSAS			
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University	191,687	197,776	196,769
KENTUCKY			
Agricultural Experiment Station, University of Kentucky	79,247	82,032	81,614
LOUISIANA			
Agricultural Experiment Station, Louisiana State University ...	58,254	62,419	62,101
College of Veterinary Medicine, Louisiana State University	42,662	41,680	41,468
MAINE			
Agricultural Experiment Station, University of Maine	20,783	20,492	20,388
MARYLAND			
Agricultural Experiment Station, University of Maryland	37,758	39,077	38,878

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Est.	Fiscal Year 1995 Est.
MASSACHUSETTS			
Agricultural Experiment Station, University of Massachusetts ..	\$11,112	\$10,719	\$10,664
School of Veterinary Medicine, Tufts University	17,927	17,412	17,323
MICHIGAN			
Agricultural Experiment Station and College of Veterinary Medicine, Michigan State University	74,654	73,946	73,569
MINNESOTA			
Agricultural Experiment Station, University of Minnesota	75,155	77,637	77,242
College of Veterinary Medicine, University of Minnesota	99,770	93,104	92,630
MISSISSIPPI			
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University	71,031	70,902	70,541
MISSOURI			
Agricultural Experiment Station, University of Missouri	66,236	64,849	64,519
College of Veterinary Medicine, University of Missouri	96,193	101,801	101,282
MONTANA			
Agricultural Experiment Station, Montana State University	71,143	71,849	71,483
NEBRASKA			
Agricultural Experiment Station, University of Nebraska	203,572	206,721	205,668
NEVADA			
Agricultural Experiment Station, University of Nevada	23,720	20,851	20,745
NEW HAMPSHIRE			
Agricultural Experiment Station, University of New Hampshire ..	8,588	8,555	8,511
NEW JERSEY			
Agricultural Experiment Station, Rutgers University	18,811	17,154	17,067
NEW MEXICO			
Agricultural Experiment Station, New Mexico State University ..	39,460	39,193	38,993
NEW YORK			
Agricultural Experiment Station, Cornell University	48,102	41,542	41,330
College of Veterinary Medicine, Cornell University	187,249	180,472	179,553
NORTH CAROLINA			
Agricultural Experiment Station, North Carolina State University	88,748	83,028	82,605
College of Veterinary Medicine, North Carolina State University	12,473	15,668	15,588
NORTH DAKOTA			
Agricultural Experiment Station, North Dakota State University	52,148	51,395	51,133
OHIO			
Ohio Agricultural Research and Dev. Center, Ohio State Univ. ..	72,082	65,553	65,219
College of Veterinary Medicine, Ohio State University	38,844	35,988	35,805
OKLAHOMA			
Agricultural Experiment Station and College of Veterinary Medicine, Oklahoma State University	142,627	153,925	153,141
OREGON			
Agricultural Experiment Station, Oregon State University	80,325	78,043	77,645
College of Veterinary Medicine, Oregon State University	15,690	13,459	13,390
PENNSYLVANIA			
Agricultural Experiment Station, Pennsylvania State Univ.	62,029	53,020	52,750
College of Veterinary Medicine, University of Pennsylvania	78,107	86,665	86,224
PUERTO RICO			
Agricultural Experiment Station, University of Puerto Rico	12,870	11,744	11,684
RHODE ISLAND			
Agricultural Experiment Station, University of Rhode Island ...	6,275	4,957	4,932
SOUTH CAROLINA			
Agricultural Experiment Station, Clemson University	26,051	25,001	24,874
SOUTH DAKOTA			
Agricultural Experiment Station, South Dakota State University	99,581	97,407	96,911

State/Recipient	Fiscal Year 1993 Actual	Fiscal Year 1994 Est.	Fiscal Year 1995 Est.
TENNESSEE			
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee	\$64,278	\$65,472	\$65,139
TEXAS			
Agricultural Experiment Station and College of Veterinary Medicine, Texas A&M University	410,628	420,172	418,032
UTAH			
Agricultural Experiment Station, Utah State University	56,858	57,997	57,702
VERMONT			
Agricultural Experiment Station, University of Vermont	13,282	13,784	13,714
VIRGINIA			
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ.	84,628	86,577	86,136
WASHINGTON			
Agricultural Experiment Station, Washington State Univ.	28,219	27,303	27,164
College of Veterinary Medicine, Washington State Univ.	146,265	130,846	130,180
WEST VIRGINIA			
Agricultural & Forestry Experiment Station, West Virginia State University	11,950	12,114	12,052
WISCONSIN			
Agricultural Experiment Station and College of Veterinary Medicine, University of Wisconsin	178,784	174,750	173,859
WYOMING			
Agricultural Experiment Station, University of Wyoming	38,629	40,309	40,103
Subtotal	5,230,856	5,231,226	5,204,581
Federal administration	222,040	222,040	222,040
Small Business Act	79,934	79,934	106,579
Biotechnology Risk Assessment	18,170	17,800	17,800
Total	5,551,000	5,551,000	5,551,000

Table 6
National Research Initiative Competitive Grants Program
Proposals Submitted and Grants Awarded in Fiscal Year 1993

Program	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
NATURAL RESOURCES AND THE ENVIRONMENT				
NR-Forest/Rangeland/Crop Ecosystems	100	21,922,778	22	\$3,505,885
NRIOGP Water Quality	149	33,345,128	22	3,398,554
Improved Utilization of Wood & Wood Fibers	116	18,290,886	30	2,508,418
Plant Response to the Environment	180	38,823,793	52	6,624,128
Triagency Natural Resources (a)	3	214,000	3	214,000
Natural Resources Strengthening	36	1,676,925	17	743,120
Subtotal	584	114,273,510	146	16,994,105
NUTRITION, FOOD QUALITY AND HEALTH				
Human Nutrition	120	31,892,556	27	3,605,210
Food Safety	71	13,566,062	17	2,279,456
Nutrition Strengthening	16	719,988	5	249,839
Subtotal	207	46,178,606	49	6,134,505
ANIMAL SYSTEMS				
Reproductive Biology	127	29,178,205	30	5,653,500
Cellular Growth/Developmental Biology	123	30,352,071	31	4,955,116
Animal Molecular Genetics	39	10,075,833	14	2,139,723
Mechanisms of Animal Disease	288	69,719,244	58	9,726,506
Animal Systems Strengthening	58	2,747,359	23	1,043,802
Subtotal	635	142,072,712	156	23,518,647
PLANT SYSTEMS				
Alcohol Fuels	21	4,080,041	6	575,000
Nitrogen Fixation/Metabolism	81	15,906,714	33	3,005,000
PS-Forest/Rangeland/Crop Ecosystem	3	605,374	0	125,000
Pathogens	225	42,154,416	63	5,744,000
Photosynthesis	77	15,719,717	28	2,580,000
Plant Genetic Mechanisms	115	28,066,023	46	4,912,000
Plant Genome	97	24,228,793	34	6,170,922
Plant Growth & Development	175	36,318,066	55	5,665,757
Plant Pest Interactions, Insects, Nematodes	253	46,945,039	73	7,372,000
Triagency Plant Systems (a)	2	365,155	2	165,155
Plant Systems Strengthening	93	4,212,690	31	1,292,759
Subtotal	1,142	218,602,028	371	37,607,593
MARKETS, TRADE AND POLICY				
Markets, Competitiveness & Technology	93	15,564,966	19	1,816,435
Rural Development	67	11,981,346	14	1,816,435
Markets Strengthening	8	365,829	3	149,530
Subtotal	168	27,912,141	36	3,782,400
PROCESSING FOR VALUE ADDED PRODUCTS				
Processing for Value Added	137	26,269,866	30	3,677,488
Processing Strengthening	20	708,875	2	99,742
Subtotal	157	26,978,741	32	3,777,230
TOTAL	2,893	576,017,736	790	91,814,480

Performing Organization	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
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1862 Land-Grant Universities	1,372	\$273,848,119	234	\$27,188,053
1890 Land-Grant Universities	44	9,057,288	3	107,386
Other	8	1,679,441	2	159,084
Other Federal Research Laboratories	22	5,938,599	9	1,366,333
Private Non-Profit	82	22,137,588	23	2,507,131
Private Profit	13	3,849,445	2	380,000
Private Universities	130	28,824,551	42	4,228,169
Public Universities	342	67,615,005	86	9,746,855
SAES	575	101,905,872	333	37,703,891
State and Local Agencies	23	2,130,225	5	370,007
USDA Agencies	167	33,761,179	30	4,221,908
Veterinary Schools & Colleges	115	25,270,426	21	3,835,663
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TOTAL	2,893	576,017,738	790	91,814,480
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- (a) Proposals submitted in FY 92 to collaborative Research in Plant Biology Program supported jointly by USDA, NSF, and DOE. Total of 66 proposals requesting \$94,182,414 were submitted. These are continuation awards.

Table 7
National Research Initiative Competitive Grants
Fiscal Year 1993 Recipients
(In Dollars)

State/Recipient	Fiscal Year 1993 Actual
ALASKA	
University of Alaska, Fairbanks	\$149,895
ALABAMA	
Auburn University	349,022
University of Alabama, Birmingham	262,000
Alabama A&M University	50,000
University of Alabama	120,000
ARIZONA	
University of Arizona	1,448,844
Arizona State University	110,000
Northern Arizona University	49,976
ARKANSAS	
University of Central Arkansas	90,000
University of Arkansas, Pine Bluff	49,886
University of Arkansas	872,790
CALIFORNIA	
University of California, Davis	4,048,262
University of California, Berkeley	1,626,500
San Diego State University	50,000
University of California, Santa Barbara	130,000
University of California, San Diego	1,100,000
University of California, Santa Cruz	35,648
University of California, Riverside	645,000
University of California, Los Angeles	355,000
Stanford University	90,215
Palo Alto Medicinal Foundation	200,000
The Salk Institute for Biological Studies	210,000
DNA Plant Technologies, Inc.	130,000
Vincent M. Eckhart	61,400
Sheila M. Colby	82,000
USDA, ARS Pacific West Area	410,000
Forest Service, Pacific SW Forest & Range Expt. Station	423,000
COLORADO	
Colorado State University	18,000
University of Denver	170,000
University of Colorado Health Sciences Center, Denver	263,000
Xenometrix, Inc.	250,000
USDA, ARS Northern Plains Area	294,065
CONNECTICUT	
Connecticut Agricultural Experiment Station	340,000
University of Connecticut, Storrs	885,342
Yale University	120,000
Wesleyan University	169,520
DELAWARE	
University of Delaware	650,490
DISTRICT OF COLUMBIA	
Carnegie Institution of Washington	205,200
USDA, ERS, ATAD	118,720
FLORIDA	
Florida State University	115,000
University of Florida	2,369,276
University of South Florida	60,000
Florida International University	90,000
Tampa Bay Research Institute	232,558

State/Recipient	Fiscal Year 1993 Actual
GEORGIA	
University of Georgia Research Foundation	1,945,580
USDA, ARS South Atlantic Area	868,000
Emory University	78,527
Institute of Paper Science & Technology	88,000
HAWAII	
University of Hawaii	439,378
IDAHO	
University of Idaho	971,559
ILLINOIS	
Illinois State University	199,710
Western Illinois University	49,994
Northern Illinois University	130,000
Northwestern University	50,000
University of Illinois, Chicago	248,000
University of Illinois, Urbana	2,090,117
USDA, ARS Mid-West Area	735,481
INDIANA	
Methodist Hospital of Indiana, Inc.	92,000
Indiana University	80,000
Purdue University	1,923,051
IOWA	
Iowa State University	1,618,755
University of Iowa	450,000
KANSAS	
Kansas State University	1,106,560
University of Kansas	85,000
KENTUCKY	
University of Kentucky	996,438
Murray State University	43,120
LOUISIANA	
Louisiana State University & A&M College	609,000
Northwestern State University	49,704
University of Southwestern Louisiana	149,930
USDA, Forest Service Southern Forest Experiment Station	410,000
MAINE	
University of Maine	388,940
MARYLAND	
University of Maryland	566,000
American Society of Tropical Veterinary Medicine	5,000
John Hopkins University	90,000
American Society for Cell Biology	5,000
USDA, ARS Beltsville Area	1,150,642
Advanced Bioscience Lab, Inc.	154,084
University of Maryland, Baltimore	212,000
MASSACHUSETTS	
University of Massachusetts	1,081,165
Massachusetts Institute of Technology	151,640
University of Massachusetts Medical School	248,063
Tufts University	129,718
Harvard University	87,160
Massachusetts General Hospital	305,000
Worcester Polytechnic Institute	50,000
MICHIGAN	
Michigan State University	1,974,038
University of Michigan	249,070
Herbert H. & Grace A. Dow Foundation	180,000
Jennifer L. Stoyenoff	69,607
Carol R. Buell	77,000

State/Recipient -----	Fiscal Year 1993 Actual	
MINNESOTA		
University of Minnesota	2,054,387	
St. Cloud State University	50,000	
Robert G. Gregerson	80,000	
MISSISSIPPI		
Mississippi State University	365,881	
University of Southern Mississippi	334,865	
MISSOURI		
University of Missouri	1,679,210	
Washington University	111,757	
MONTANA		
Montana State University	637,509	
University of Montana	90,000	
NEBRASKA		
University of Nebraska	1,337,408	
NEVADA		
University of Nevada	220,052	
NEW HAMPSHIRE		
University of New Hampshire	497,459	
Dartmouth College	60,000	
NEW JERSEY		
Rutgers, The State University	704,816	
NEW MEXICO		
New Mexico State University	404,013	
NEW YORK		
Cornell University	4,275,617	
State University of New York, Albany	684,000	
State University of New York, Buffalo	351,138	
University of Rochester	53,000	
Boyce Thompson Institute	725,873	
Rensselaer Polytechnic	80,000	
New York University	70,000	
Siena College	120,000	
State University of Binghamton	100,000	
New York Botanical Garden	100,000	
Roswell Park Division & New York State Dept. of Health	132,500	
NORTH CAROLINA		
North Carolina State University	1,690,818	
University of North Carolina, Chapel Hill	796,460	
Duke University	614,000	
NORTH DAKOTA		
North Dakota State University	1,251,011	
University of North Dakota	100,000	
OHIO		
Ohio State University Research Foundation	1,447,825	
Ohio University	110,000	
Case Western Reserve University	112,000	
Miami University	425,000	
OKLAHOMA		
Oklahoma State University	602,758	
University of Oklahoma	125,000	
Langston University	7,500	
University of Tulsa	48,911	
University of Central Oklahoma	48,990	
OREGON		
Oregon State University	949,341	
University of Oregon	340,000	
Oregon Health Science Institute	150,000	

State/Recipient	Fiscal Year 1993 Actual
PENNSYLVANIA	
Pennsylvania State University	2,989,581
Duquesne University	239,969
University of Pennsylvania, Philadelphia	484,327
USDA, ARS North Atlantic Area	545,000
Millersville University of Pennsylvania	49,875
West Chester University of Pennsylvania	49,960
Drexel University	90,000
Lehigh University	95,000
RHODE ISLAND	
Gordon Research Conference	49,000
University of Rhode Island	285,318
Brown University	150,000
SOUTH CAROLINA	
University of South Carolina	161,012
Clemson University	568,280
Medical University of South Carolina	122,009
SOUTH DAKOTA	
South Dakota State University	360,981
Augustana College	68,472
University of South Dakota	100,000
TENNESSEE	
Vanderbilt University	110,000
University of Tennessee, Knoxville	764,783
TEXAS	
Texas Tech University	575,538
University of Texas, Austin	200,000
Texas Tech University Health Science Center	215,000
Baylor College of Medicine	370,000
Rice University	100,000
University of Texas Southwestern Medical Center at Dallas	237,000
Texas A&M Research Foundation	4,085,158
Southern Methodist University	70,000
Trinity University	59,930
USDA, ARS Southern Plains Area	100,000
University of Texas M.D. Anderson Cancer Center	212,209
UTAH	
Utah State University	110,000
University of Utah	230,000
Brigham Young University	120,000
VERMONT	
University of Vermont	568,300
Lyndon State College	49,770
VIRGINIA	
Virginia Polytechnic Institute & State University	893,980
James Madison University	175,000
Virginia Commonwealth University	123,781
WASHINGTON	
Washington State University	1,737,003
University of Washington	916,744
NW Fisheries Science Center, Coastal Zone & Estuarine Studies	222,000
WEST VIRGINIA	
West Virginia University	910,502

State/Recipient	Fiscal Year 1993 Actual

WISCONSIN	
University of Wisconsin, Madison	4,296.805
Forest Service, Forest Products Laboratory	311.333
Medical College of Wisconsin	165.000
University of Wisconsin, Milwaukee	74.692
WYOMING	
University of Wyoming	579.429

Total	91,814.480
Federal administration (4%)	3,900.000
Small Business Act	1,404.000
Biotechnology Risk Assessment	381.520

Total	97,500.000
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Table 8
National Needs Graduate Fellowships Grants
Proposals Submitted and Grants Awarded in Fiscal Year 1993

	Proposals Submitted			Grants Awarded		
	Proposals Received	Fellows Requested	Dollars Requested	Grants Awarded	Fellows Supported	Dollars Awarded
Biotechnology Plant	29	110	\$5,940,000	10	21	\$1,134,000
Food, Forest Products or Agribusiness Marketing	36	125	6,750,000	11	21	1,134,000
Human Nutrition (a)	1	1	18,480	1	1	18,480
Water Science	24	93	5,022,000	10	21	1,108,520
TOTAL	90	329	17,730,480	32	64	3,395,000

(a) Completion of funding for a partial fellowship awarded in FY 1992.

Table 9
National Needs Graduate Fellowship Grants
Fiscal Year 1993 Recipients
(In Dollars)

Area/Recipient -----	Fiscal Year 1993 Actual -----
BIOTECHNOLOGY - PLANT	
Iowa State University	162,000
Worcester Polytechnic Institute, Massachusetts	108,000
Michigan State University	108,000
University of Minnesota	216,000
Cornell University, New York	108,000
North Carolina State University	216,000
Oregon State University	108,000
Pennsylvania State University	108,000
ENGINEERING - FOOD, FOREST PRODUCTS OR AGRICULTURAL	
University of California, Davis	216,000
University of Florida	108,000
University of Illinois	162,000
University of Nebraska	54,000
Rutgers University, New Jersey	108,000
Cornell University, New York	162,000
Oregon State University	108,000
Texas A&M University	54,000
University of Wisconsin	162,000
HUMAN NUTRITION	
University of Wisconsin (a)	18,480
WATER SCIENCE	
University of California, Davis	108,000
University of California, Riverside	108,000
Colorado State University	108,000
University of Florida	108,000
Michigan State University	108,000
University of Minnesota	108,000
University of Nebraska	162,000
North Carolina State University	82,520
Oklahoma State University	108,000
Texas A&M University	108,000
Subtotal	3,395,000
Federal administration (3%)	105,000
Total	3,500,000 =====

(a) Completion of funding for a partial fellowship awarded in FY 1992.

Table 10
 Competitive Challenge Grants
 Fiscal Year 1993 Recipients
 (In Dollars)

Recipient -----	Fiscal Year 1993 Actual -----
California Polytechnic State University.....	\$62,587
Colorado State University.....	64,568
University of Connecticut.....	48,278
Florida State University.....	68,000
Iowa State University.....	130,000
University of Illinois.....	71,950
Purdue University.....	130,000
University of Kentucky.....	64,475
Louisiana Tech University.....	44,279
Michigan State University.....	71,472
University of Minnesota.....	65,803
New Mexico State University.....	130,000
Cornell University.....	45,527
Oregon State University.....	130,000
Texas A&M University.....	64,568
Texas Tech University.....	66,825
Utah State University.....	67,985
Virginia Polytechnic Institute and State University....	128,683
Subtotal	1,455,000
Federal administration (3%)	45,000
Total	1,500,000
	=====

Table 11
1890 Institution Capacity Building Grants
Fiscal Year 1993 Recipients
(In dollars)

Category/Recipient -----	Fiscal Year 1993 Actual -----
Research Capacity Building Grants	
Alabama A&M University	\$602,308
Tuskegee University, Alabama	560,879
Delaware State College	276,098
Florida A&M University	594,635
Fort Valley State College	297,500
Kentucky State University	688,640
University of Maryland, Eastern Shore	254,040
Alcorn State University, Mississippi	329,292
North Carolina A&T State University	287,280
Langston University, Oklahoma	272,041
South Carolina State College	296,301
Prairie View A&M University	281,454
Virginia State University	152,953
Subtotal, Research Grants	4,893,421
Teaching Capacity Building Grants	
Alabama A&M University	382,363
Tuskegee University, Alabama	423,792
University of Arkansas-Pine Bluff	343,480
Delaware State College	283,571
Florida A&M University	380,477
Kentucky State University	189,919
Southern University.....	373,600
University of Maryland-Eastern Shore	423,524
Lincoln University	136,651
Alcorn State University, Mississippi	225,000
North Carolina A&T State University	721,398
Langston University, Oklahoma	562,241
Tennessee State University	339,152
Prairie View A&M University	186,082
Subtotal, Teaching Grants	4,971,250
Federal administration (3%)	307,500
Small Business Act	74,569
Biotechnology Risk Assessment	3,260
Total	10,250,000

COOPERATIVE STATE RESEARCH SERVICE

STATUS OF PROGRAM

Current activities, progress, and current programs under the CSRS appropriation items are outlined below:

PAYMENTS UNDER THE HATCH ACT

The Hatch research program at the State Agricultural Experiment Stations is designed to promote efficient production, marketing, distribution, and utilization of crops and livestock essential to the food supply, health and welfare of the American people while conserving resources and improving rural living conditions. Equally important, students are provided training opportunities to assist in scientific research projects conducted at the State Agricultural Experiment Stations.

The following describes current activities and selected examples of accomplishments supported under this appropriation item.

CURRENT ACTIVITIES

Hatch Act funds support the following types of research.

- Forest and Natural Resources - Fourteen percent of total Hatch research funds are allocated to this program. Areas of research include forestry, soil and land use, water and watersheds, outdoor recreation, environmental quality, fish and wildlife, and remote sensing. Forestry related research under the Hatch Act is closely coordinated with the McIntire-Stennis Cooperative Forestry Research program which has similar research objectives. The Hatch forestry research program is characterized by a high degree of multi-institutional or regional projects.
- Crop Resources - This program receives forty percent of total Hatch funds for research. Included in this research are crop protection and production systems for dependable and efficient production, quality improvement, quality maintenance, product development, and related commodity aspects of crops marketing.
- Animal Resources - Twenty-six percent of total Hatch funds are allocated to this research program. Areas of research include protection, production, and management of beef and dairy cattle, swine, sheep, other animals, poultry, and aquaculture. Also included are quality improvement, product development, and related commodity aspects of marketing.
- People, Communities, and Institutions (Including Rural Development) - This program receives five percent of total Hatch funds for research. Included in this area are individuals and families, living environment, communities, institutions, and services.
- Competition, Trade, Adjustment, Price and Income Policy - Six percent of total Hatch funds for research are allocated to this program. This research addresses farm adjustments, prices and income, economic aspects of marketing, and competition.
- Food Science and Human Nutrition - This program receives five percent of total Hatch funds for research. Research areas include human nutrition, food processing, food safety, food service and storage, distribution, and marketing.

SELECTED EXAMPLES OF RECENT PROGRESS

Stable Isotopes to Measure Calcium and Vitamin D Interactions in Humans.

Vitamin D deficiency results from gastrointestinal diseases in which calcium absorption is poor and when diets low in absorbable calcium are consumed. Researchers in Connecticut hypothesized that the vitamin D deficiency resulting from inadequate calcium absorption is caused by a faster breakdown of vitamin D metabolites. To study this in humans, a protocol was developed using a new form of vitamin D labeled with a non-radioactive isotope deuterium and two non-radioactive calcium isotopes. Young men were fed diets high in fiber and low in calcium, and the metabolism of labeled calcium and vitamin D was followed. The study showed that the breakdown of vitamin D was twice as fast as had been demonstrated previously using less accurate methods. Large amounts of dietary fiber reduced calcium absorption from the diet and slowed down calcium metabolism in bone. The rate of vitamin D breakdown was faster when calcium absorption was poor. The realization that vitamin D is degraded more rapidly infers that the requirement for this vitamin should be increased.

Regulatory Proteins are Altered by Riboflavin Status and Caloric Restriction.

Changes in diet can alter the way in which people utilize energy and, consequently, growth. However, processes such as growth actually represent a wide range of biochemical processes which must all be turned on or off systematically. Researchers in Minnesota believe that coordination is accomplished by nuclear regulatory proteins. That is, some dietary event signals a change in specific nuclear regulatory proteins that then alter the way in which specific regions of nuclear DNA are transcribed to messenger RNAs which, in turn, results in changes in enzymes. Nuclear enhancer binding proteins (NEBP) have been proposed to be very important in regulation of energy metabolism. The researchers fed rats a diet deficient or adequate in riboflavin where energy metabolism and growth are profoundly altered. Because riboflavin deficient rats voluntarily decrease their food intake, a caloric restricted group was included. NEBP increased 2-fold due to caloric restriction and 3-fold with riboflavin deficiency. These changes in the NEBP were shown to be the result of changes in the level of their specific messenger RNAs. Further, the change in messenger RNAs could be explained by changes in how fast the specific RNAs were transcribed from the DNA templates. They concluded that the level of these nuclear regulatory proteins respond to changes in dietary status and that these changes are regulated at the level of transcription.

Mapping The Swine Genome. Eight Agricultural Experiment Stations (Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Oklahoma and Wisconsin), three ARS Laboratories (Nebraska, Maryland and Iowa) and one other university

(Northeastern) are cooperating in Regional Research Project NC-210 to map the swine genome. Rapid progress is being made. Over 200 polymorphic loci have been identified and located on the chromosomes. Research at the Iowa Agricultural Experiment Station has determined that the major histocompatibility complex (MHC) of genes in swine is located on chromosome 7. These MHC genes have been associated with health traits, and four specific MHC genes have been identified and located on chromosome 7. Swine genome research will result in swine breeders being able to more effectively select pigs that grow faster, have larger litters, and are leaner and healthier. Producers and consumers will benefit from a more efficient pork industry that produces pork products of higher quality.

Gene Transfer to Improve Body Composition in Beef Cattle. Methodology has been developed at Iowa State University to transfer specific genes containing DNA into the cells of growing and adult cattle. The gene being transferred becomes active in the liver cells and produces the protein encoded by the transferred gene. This technique has been used successfully, using cells in culture and in animals, to alter body composition by diverting body weight gain to lean tissues and less to adipose tissue. Consumers, cattle producers

and processors could benefit from the new technology which diverts body weight gain away from adipose tissue triglycerides (fat) and toward muscle protein. These techniques of gene delivery could also be adapted for genetic treatment of human and animal diseases.

Reproductive Management in Dairy Cattle and Sheep. Ultrasonography has been used to develop non-invasive procedures for the daily visual observation of the ovaries and reproductive tracts of cows and ewes. Research at New York has characterized follicular dynamics during the estrous cycles of dairy heifers, and similar techniques have been used with cows to investigate follicular dynamics at Missouri, synchronization of ovulation at Wisconsin, and early embryonic death losses at Kansas. Studies with sheep at West Virginia have enabled early pregnancy diagnosis and the monitoring of the reproductive tract and ovaries in cycling and non-cycling ewes to detect pregnancy, twinning, early post-breeding conception failure, aberrant ovarian function and seasonal anestrus. These techniques may be used to enhance the management of flocks and herds.

Treatment and Recycling of Poultry and Swine Wastes. A high temperature (50-55 C) anaerobic reactor for animal waste digestion and conversion to methane has been developed for the reduction, treatment and recycling of poultry and swine wastes. The digestion process has been demonstrated to be highly efficient in a low-cost model digester constructed and operated at North Carolina. In addition to the production of biogas, the solid residue harvested from the digester is high in calcium, phosphorus, and other nutrients, and can be successfully used as an animal feed supplement. The digestion process within the system has been shown to kill all pathogens tested, and thus, protect environmental health. This technology is especially beneficial, since it converts animal waste to a useful energy source, and reduces the need to spread animal manures on land.

Development of Improved Diets for Swine and Poultry. Use of the ideal protein concept allows more accurate formulation of diets for swine and poultry to meet amino acid requirements with minimal excesses under all dietary, environmental and body compositional conditions. Nitrogen waste products (feces and urine) are minimized. In trials conducted at Illinois, optimal ratios of lysine to other indispensable amino acids such as threonine, cystine and tryptophan were developed for growth and body protein accretion in growing swine and poultry. Since amino acid requirements vary widely as a function of sex, body leanness (due to genetics), and dietary metabolizable energy, nutritional modeling using the ideal protein concept should provide substantial savings to these animal industries.

Codling Moth Mating Disruption. A synthetic mixture containing three compounds of the female sex pheromone of the codling moth were permeated through an isolated Asian pear orchard with a recorded history of codling moth infestations. This procedure by the University of California provided excellent suppression of the codling moth in the Sacramento Valley orchard. This selective intervention in the management of orchard moths avoids deleterious effects upon beneficial agents and avoids substantial losses in apple, pear, walnut and plum orchards in California that might occur if no control measures were taken.

Biosystematics of Insects. Extensive monitoring of the deer tick in Illinois has resulted in the confirmation of its infestation in five counties where it had not previously been detected. This brings the total number of counties that are infected by the pest in the state to eighteen. 20-30% of the ticks in the two counties that have the severest infestation were found to carry the spirochete for Lyme Disease. This information gathered by the University of Illinois has significance for the recreational use of public lands in these counties as well as for determining control techniques.

Fertilizer Management. Wyoming researchers have determined that point injection of nitrogen fertilizer used for sugar beet production can increase the efficiency of nitrogen recovery and reduce the application rate needed for optimum yield by 40-50 pounds of nitrogen per acre. This could mean a savings of \$500,000-\$750,000 in fertilizer cost for Wyoming sugar beet producers while reducing nitrogen leaching loss and the potential for ground water pollution.

Waste Management. A multidisciplinary effort at Auburn University involved agronomists, horticulturalists, animal scientists, agricultural engineers and others to develop new options in waste management. This research is helping to define the pollution potential and improve application methods for broiler litter to ensure its environmentally-sound use. The work has already shown that poultry litter can be composed to form a high-quality fertilizer, ensiled with forages and/or used in potting media for ornamental plants. Other studies include the safe disposal of chicken carcasses, construction of wetland filters for hog lagoons and using cotton gin trash and newsprint as soil amendments.

A New Route to Boosting Yields of Important Crops. A scientist at Cornell University has applied a new analytical system for yield with statistical methods for breeding trials. This approach has increased bean yields by 30% and demonstrated that plant breeders have the potential for major increases in crop yields world-wide. This approach is contrary to prevailing thought that the crop yields cannot be increased significantly through traditional methods.

Beginning in 1988, Cornell scientists have used computer-based statistical methods to quantify the interaction between crop genetics and the environment, paying special attention to the total weight of the plant biomass, compared to yields since 1970. Biomass accumulation per day in yield trials is now understood to be a critical parameter in selecting cultivars that have the potential to yield more than currently used varieties. This analytical method has been applied to scores of field trials of beans, corn, and soybeans conducted throughout the United States, Canada, Mexico, and Central America. These studies have established new principles to guide plant breeders in their research aimed at producing higher yielding plants that are better tailored to specific locations and growing seasons.

Production of Low Fat Dairy Products. Consumer interest in reducing their fat intake has resulted in a market for low and reduced fat and cholesterol dairy products. Researchers at South Dakota State University developed a process which incorporates steam-stripped, cholesterol-free anhydrous milk fat at various levels into skim milk which can then be used for manufacturing fluid milk products and other low fat, low cholesterol value-added dairy products such as cheese and ice cream. The process has been used by seven food companies in the U.S. to manufacture and market low fat, low cholesterol fluid milk products; the companies are also investigating the manufacture and marketing of other low fat dairy products using the process.

Detection of Seafood Toxins. Finfish frequently become toxic due to the ingestion of toxin-producing microscopic algae; exposure of humans through ingestion of such foods results in serious and sometimes fatal poisonings such as ciguatera. Researchers at the University of Arizona developed a solid-phase immunobead method kit for practical analysis of toxins associated with ciguatera poisoning. This test kit can be used for seafood monitoring programs to identify harvest areas of low risk potential and to monitor fish in the marketplace, from fishing vessels to the consumer. A diagnostic kit was also developed by the researchers to detect ciguatera-related compounds in human serum, making it possible to properly diagnose illnesses associated with these seafood toxins. These tests can also be used for detection in shellfish and clinical diagnosis of diarrhetic shellfish poisoning. The researchers are working closely with a private sector concern to commercialize the test kits.

Immobilized Cell Bioreactor for Milk Fermentations. Use of bioreactors for milk fermentation may allow continuous, automated production of fermented dairy foods. Such processes could reduce the labor costs and time requirements of current processing methods. Researchers at North Carolina State University designed and characterized a bioreactor that could be used for continuous acidification and inoculation of milk with starter culture. The starter bacteria was entrapped or immobilized in a calcium alginate gel matrix and spread as a thin film on a spiral stainless steel mesh which was then placed in the bioreactor through which milk could be passed continuously for fermentation. This novel immobilized cell bioreactor exhibits greater fermentation productivity and less susceptibility to phage infection during continuous bioprocessing of milk than a free-cell bioreactor. At least one major food processor has expressed an interest in the process.

Ruffed Grouse. Ruffed grouse are generally acknowledged to be the "king of gamebirds," renowned for their elusive habits and erratic flight. Historically, they have been considered the prime example of a wildlife species that could not be affected by hunting. Wildlife Ecology researchers at the University of Wisconsin-Madison have previously documented high harvest rates of ruffed grouse on public lands near cities, but, generally, these results have been considered to have limited application to regional grouse populations in the Lake States. In the past four years, the researchers have documented surprisingly high harvest rates on relatively remote areas in northwestern Wisconsin. These areas were selected specifically because hunting pressure there was thought to be low. These results have caused researchers and managers alike to pay more attention to the potential influence of hunting on the distribution and abundance of this popular gamebird.

Agricultural Research Applies Tools to Benefit Measurement. Exactly how one goes about evaluating the benefits derived from goods that do not enter into the normal (economic) marketplace has continued to receive the attention of scientists since the early 1960's. While there are no definitive answers, researchers supported by Hatch funding, have led the way in the implementation of existing theoretical concepts to provide information to help resolve issues facing public agencies in the initial location and relocation of publicly provided recreation facilities. One such grouping, consisting of researchers at Colorado State University, the University of California, and the University of Kentucky, has used the concepts developed to assist the Army Corps of Engineers in addressing significant policy issues.

COOPERATIVE FORESTRY RESEARCH

The Cooperative Forestry Research (McIntire-Stennis) program provides knowledge essential to the efficient and effective use of the Nation's forest resources. Timber production, forest land management, wood utilization, and the associated development of new products and distribution systems are the key elements of forestry research. This research also deals with the other forest products -- wildlife, recreation, water, range, and environmental quality -- whose production, management, and distribution are an inextricable part of the long term productivity and profitability of the integrated system of forest resources.

In addition, the Cooperative Forestry program has the objective of helping to create and maintain a highly qualified cadre of forest scientists through their direct involvement in the research projects as a part of their graduate education. These young men and women, educated in the sciences fundamental to forestry, will ultimately help to maintain the well-being of the United States through service in private industry, in various levels of government, and in academic institutions as managers and scientists.

Following is a description of some of the major activities of the program and selected examples of accomplishment supported under this appropriation item.

CURRENT ACTIVITIES

The following research program activities indicate the range of research funded under this Act:

Forestry research is broadly inclusive and thus deals with many of the current concerns of the Nation. Several areas that have long been important in forestry research include acid rain, global climate change, recreation, wetlands, reforestation, and carbon dioxide concentration in the atmosphere.

Increasing the profitability of the forest resource base through effective management of the forest resource is being vigorously pursued.

Biotechnology in forestry promises to enhance the benefits from modified trees due to faster growth rates, improved wood characteristics for various uses, and greater freedom from losses due to insects and diseases. The latter achievement would reduce the need to use chemicals to control these forest pests, thus benefiting the environment.

The advent of high capacity microcomputers has made possible several developments in information management such as: expert systems, data base manipulations, and map and image processing. Forestry research is combining these new tools for improved management capability for production of the multiple outputs of forests.

Water quality and quantity is a major aspect of forest management which is becoming more essential as our population grows. Forests cover one-third of the nation's land and are initial recipients of an even larger portion of the precipitation received. Research to improve water yield from forested watersheds is a major thrust.

Forest wildlife research is providing essential information for science-based wildlife management. This research is also the basis for forest managers to understand and deal with the impacts of wildlife on the forest, as well as to know the effects of forestry practices on wildlife species associated with forests.

Changes in the agricultural economy make it imperative that research efforts focus on enhancing productivity and conserving resources. Research programs are seeking to develop knowledge and techniques which will facilitate wise choices in the utilization of the nation's forest resources.

SELECTED EXAMPLES OF RECENT PROGRESS

Holistic Forest Health Increases Efficiency. Scientists at Oregon State University's College of Forestry have shown that trees growing on thinned plots had a 60% increase in growth efficiency while trees on plots that were both thinned and fertilized averaged a 135% increase. This research suggests that as ponderosa pine forests are replaced by species such as grand fir, a result of fire suppression, nitrogen demands increase beyond levels normally supplied in the ponderosa pine/true fir type. The additional stress in stands with late successional species, such as grand fir, makes the stands susceptible to insects, fires, and ultimately mortality. Such studies have given rise to the concept of Integrated Forest Protection, a holistic approach to forest ecosystem health. This theory would postulate that the general health of forest trees and, thus, of ecosystems is closely linked to minimizing stresses such as drought and soil infertility -- i.e., reduction of those stresses which predispose a tree and a stand to insect and disease damage.

Wood Processing Facilities. Primary and secondary wood processing facilities provide economic benefits to many segments of the U.S. economy. Plywood manufacturing is one such industry. It provides jobs in rural communities, markets for timber, and consumer products that are competitive world wide. Researchers at Mississippi State School of Forest Resources examined the product mix a plant could manufacture and sell given product prices, timber costs, glue costs, and labor and other operating expenditures. The resulting decision model is now in use by 14 plywood plants which are saving an estimated \$1 million per plant per year.

Growing Trees Instead of Weeds Saves Money. Weed control in forest nurseries can greatly influence seedling size and number. In past years, weed control was a large portion of production cost and has caused significant reductions in the quality of seedlings produced from forest nurseries. A research project at the Auburn University School of Forestry has greatly enhanced managers' ability to control weeds in such nurseries. Weeding costs at some nurseries have dropped from 20% of production costs to less than 1%. Estimated total savings in weeding costs at forest nurseries in 13 southern states exceeds \$2 million each year. All of the currently used herbicides in southern nurseries were registered with data based on this project.

Modified Disk Flaker Design and Process Methodology. In many wood processing operations, raw wood is first reduced to more fundamental components through mechanical or chemical action. Scientists at the University of Georgia School of Forestry have developed a modified disk flaker design and process methodology for processing residues into curled shavings. The wood curls have been found especially useful as (a) a biodegradable and renewable resource-based alternative to the non-degradable and petroleum based foamed polystyrene "peanuts and chips" commonly used as cushioning loose fill in packaging and (b) as a low dust large animal bedding. To date, the patents have been licensed to a company which has nine machines in operation at six locations in the U. S. Overseas agreements are being negotiated and plans call for having as many as forty or more machines in operation by 1995.

Bacteria Help Cleanse Treating Plant Sites. Bioremediation of polychlorinated phenols and creosote residues in soils and groundwater from abandoned wood preservation plants and other manufacturing sites has proven to be effective. Researchers in the Department of Forest Products, School of Forest Resources, Mississippi State University have isolated and grown bacteria that breakdown these hazardous chemicals into carbon dioxide, water and other non-hazardous residues. These biological agents have been proven a cost effective and efficient means to reduce these hazardous wastes at several test sites throughout the nation.

EVANS-ALLEN PROGRAM, 1890 COLLEGES AND TUSKEGEE UNIVERSITY

The Evans-Allen formula-funded research program for the 1890 Colleges and Tuskegee University was established in the Food and Agriculture Act of 1977, as amended. Section 1445 of P.L. 95-113 authorized annual appropriations to support continuing agricultural research at the 1890 Colleges and Tuskegee University and funds were appropriated beginning in FY 1979. This program indirectly supports development of agricultural expertise by providing training opportunities for students to assist in the research projects being conducted by scientists at these institutions.

The following is a description of current activities and selected examples of accomplishments supported under this appropriation item.

CURRENT ACTIVITIES

The annual research program at the 1890 Colleges and Tuskegee University places emphasis on small-scale agriculture, human nutrition, rural development and quality of living, crop resources, and animal resources.

Small-Scale Agriculture. Research on farm systems for small scale producers must be totally integrated into a comprehensive plan responsive to total needs of a particular farm enterprise system coupling production, utilization, and marketing of the farm commodity. In order to increase agricultural incomes from small farm units, total comprehensive research plans have been developed that consider all aspects of cost and management efficiencies in production, utilization, and marketing and then integrate these separate factors into a comprehensive program package.

Human Nutrition. Human nutrition research provides fundamental knowledge about the relationship of food eaten by people to their physical and mental status and development and the levels of well-being maintained during their life span. Research has also been conducted on human requirements for nutrients.

Rural Development and Quality of Living. Research on income improvement in rural communities identifies ways by which depressed areas can attain full economic potential. Only by providing adequate income opportunities can these communities retain more of their young people and finance the kind of public and private facilities and services that make them attractive places to live.

Crop Resources. Breeding, selection, and use of crops is a major concern of scientists. This includes development of drought, insect, and disease resistant cultivars. Evaluation of the efforts of crops to be grown on soils not suitable for commonly grown crops because of pathogens, nematodes, and insects are being undertaken. Studies are being conducted on the mechanisms of both natural and artificial regulators that are known to influence plant growth and development.

Animal Resources. Studies are being conducted on disease, parasites, and other health hazards that are major causes of reduced productivity in food animals. Research objectives are aimed at the development of technology for prevention, treatment, and control of these problems. Research of sufficient concentration is being undertaken to elucidate the cellular mechanisms that govern protein and fat synthesis in farm animals. Investigations of genetic, nutrition, and endocrinological factors provide needed information on biomechanisms.

SELECTED EXAMPLES OF RECENT PROGRESS

Enhancing Aflatoxin Resistance. Nutritional and Flavor Quality of Peanut. Researchers at Florida A&M University are working on identifying plant factors responsible for aflatoxin contamination of peanut under drought stress conditions. In this connection, an in vitro seed culture system has been developed to grow immature peanuts in an artificial media. This culture system supported growth of peanut seed of different maturities as determined by changes in morphological characteristics such as cracking of the seed coat, increase in seed size and weight, and seed germinability. Like the field grown peanuts, in vitro cultured seeds also produced phytoalexins (antimicrobial compounds) as well as aflatoxins following fungal (*Aspergillus* spp.) infestation. In addition, imposition of drought stress in cultures caused loss in the ability of the seed to produce phytoalexins and increased susceptibility to aflatoxin contamination. The seed culture system is being used to identify peanut genotypes resistant to aflatoxin contamination under drought stress.

Factors Affecting Quantity of Fiber Growth. Langston University (Oklahoma), researchers developed an isolated skin perfusion technique to study the effects of hormones and nutrient uptake by the skin for mohair production. The technique was validated using glucose and insulin. Thus, it is possible to isolate the skin and study mohair production and the utilization of nutrients by the skin independently of metabolism in the whole animal. With

this procedure, one obtains the isolation benefits of an in vitro procedure, with the long-term viability of an in vivo system.

Allopathic Effects of Crop Plants and Weeds on Soybean. Langston University (Oklahoma) research efforts have resulted in isolation of a phytotoxin from water extract of lambsquarters shoots. The phytotoxin is more effective against broad leaf (dicotyledonous) plants at pre-germination than at post-germination stage, and is slowly biodegradable. Presumptive identification of the phytotoxin indicates chlorogenic acid as the principal component. It has a potential of being useful as a base in formulation of a herbicide. Based on the specific physiological function being affected by the phytotoxin (chlorogenic acid), some structural modification of the compound is likely to lead to development of a herbicide formulation.

Effects of Dietary n-3 Fatty Acids on Hypertension and Lipid Metabolism. Hypertension plays a major role in cardiovascular morbidity and mortality in the United States affecting 60 million Americans. It costs American people and government almost \$15 billion a year. Dietary intervention gives an early therapeutic option to the American public in the primary prevention of hypertension. A Lincoln University (Missouri) study was conducted to evaluate the beneficial effects of dietary n-3 fatty acids on hypertension. Feeding diets containing n-3 fatty acids at 15% of the dietary energy level, which were obtained from canola oils and fish oils, were effective in reducing systolic blood pressure in salt-induced and spontaneously hypertension rats. This attenuation of hypertension by dietary n-3 fatty acid in both hypertension animal models was mediated through reduction in the activity of sympathetic nervous system.

ANIMAL HEALTH AND DISEASE RESEARCH

The Animal Health and Disease Research (Section 1433, Public Law 95-113, as amended) formula program is dedicated to improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal diseases transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; and facilitating the effective treatment and prevention of animal diseases.

The following is a description of current activities and selected examples of accomplishments supported under this appropriation item.

CURRENT ACTIVITIES

Funds for this program have been appropriated since FY 1979. Institutions receiving FY 1993 funds include 38 State Agricultural Experiment Stations and 17 Colleges of Veterinary Medicine qualifying individually. Additionally, at 13 other universities the Station and Veterinary College qualified as combined institutions. Legislative amendments contained in Public Law 97-98, provide that an "eligible institution" for Animal Health and Disease Research funds "means an accredited school or college of veterinary medicine or a State Agricultural Experiment Station that conducts animal health and disease research."

Recommendations of the Animal Health Science Research Advisory Board are being followed in program implementation (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions and other questions on program administration). In accordance with advice from the Board, emphasis in this research centers on the solution of high priority diseases or other animal hazards in the production of livestock, poultry, and aquaculture species.

State Comprehensive Plans for animal health research, approved by CSRS, are being followed by the eligible institutions within each State. These plans include the major areas of animal health research to be conducted by the institutions. Provisions of Section 1433 permit selection of studies within each State based on highest priority needs and capabilities of the institutions to conduct the needed research.

SELECTED EXAMPLES OF RECENT PROGRESS

Constructed a Linkage Map of the Bovine Genome. Scientists at the University of Illinois, the University of Wisconsin, and Texas A&M University have contributed to the construction of the first linkage map of the bovine genome. The map will be a primary tool in the identification of gene markers for disease resistance in cattle. The results from this research have linked DNA gene markers for "Weaver" disease in Brown Swiss Cattle and polled (hornless) characteristics in *Bos taurus* cattle.

Developed a Molecular Genetic Test for Porcine Stress Syndrome. Scientists at the University of Minnesota, College of Veterinary Medicine have determined the genetic basis for porcine stress syndrome (PSS). Based on these research results, a molecular genetics test for identifying normal and mutant alleles of the PSS gene has been developed. The test provides, for the first time, the ability to identify previously unidentifiable heterozygote animals. Studies using the technique to identify PSS animals within swine herds indicate that most herds in the United States carry the gene. Breeding programs to eliminate PSS from swine herds is now feasible.

Identified Causes for Porcine Reproductive and Respiratory Syndrome. The causative agent of mystery swine disease has been identified and characterized by scientists at South Dakota State University and the University of Minnesota. The disease affects 40 percent of herds in the Midwest and causes abortions, stillbirths, weak pigs, pneumonia and immunosuppression. Identifying the viral causative agent will enable the development of diagnostic techniques, control programs and vaccines to combat this disease problem.

Inherited Disorders in Dairy Cattle. Genetic defects result in severe economic losses in livestock production. Thus, it is very important to identify deleterious genes and eliminate them from the population whenever possible. It is particularly important that dairy bulls selected for use in artificial insemination companies be free of known genetic defects. Research at the Illinois Agricultural Experiment Station has identified two important genetic defects in dairy cattle, deficiency of uridine monophosphate synthetase (DUMPS) and bovine leukocyte adhesion deficiency (BLAD). Both are caused by an autosomal recessive gene. Laboratory tests have been developed that can accurately identify heterozygous "carrier" individuals. Application of this information by dairy cattle breeders will virtually eliminate these defective genes from dairy cattle.

Mastitis Control in Dairy Heifers. The prophylactic treatment of bred heifers with intramammary antibiotic therapies prior to their first lactation is an efficacious method of reducing udder infections during their first lactation. Traditionally, the mammary glands of non-parous heifers have been regarded as uninfected, but recent investigations have demonstrated that these animals are subject to infections during late gestation, especially with Staphylococcus aureus. Studies at Tennessee and Louisiana have demonstrated that these infections of mastitis-causing pathogens can be eliminated by antibiotic therapies in late gestation. In addition, treated quarters are free of antibiotic residues at freshening, and remain relatively infection free and have lower somatic cell counts during the subsequent lactation. Thus, dairymen benefit from reduced mastitis and more efficient milk production, while consumers benefit from higher quality dairy products.

1890 INSTITUTION CAPACITY BUILDING GRANTS
(FEDERAL ADMINISTRATION - DIRECT APPROPRIATION)

CURRENT ACTIVITIES

The 1890 Institution Capacity Building Grants Program, begun in FY 1990, serves as the crux of the Department of Agriculture's high priority initiative to advance the teaching and research capacity of the 1890 Land-Grant Institutions and Tuskegee University. It reflects USDA's commitment to encouraging more minorities to prepare for careers as food and agricultural scientists and professionals. The program is competitive in nature and provides support for teaching and research projects in targeted high priority areas. Matching support from non-Federal sources has been encouraged and the 1890 institutions have demonstrated an ability to attract matching funds. The program also requires cooperation with one or more USDA agencies in developing a proposal and carrying out a project thereby strengthening departmental partnerships and linkages with these important historically black institutions.

SELECTED EXAMPLES OF RECENT PROGRESS

In FY 1993, \$10.25 million were appropriated for the Capacity Building Grants Program. Of this amount, approximately \$5.0 million were allocated to support teaching projects and about \$4.9 million were allocated to research projects. Targeted need areas for teaching projects included curricula design and materials development, faculty preparation and enhancement, instruction delivery systems, student experiential learning, instrumentation for teaching, and student recruitment and retention within the fields of agriculture, natural resources, forestry, veterinary medicine, home economics, and closely allied disciplines. Research areas included studies and experimentation in the food and agricultural sciences, establishment of centralized research support systems, and development of improved technology delivery systems for producers and consumers concerned with the food and agricultural system.

In FY 1993, 49 grants were awarded competitively. The following reflects the number of proposals submitted and grants awarded.

	<u>Proposals Submitted</u>		<u>Grants Awarded</u>	
	<u>Proposals Received</u>	<u>Dollars Requested</u>	<u>Grants Awarded</u>	<u>Dollars Awarded</u>
Research Grants	110	\$30,634,759	22	\$4,893,421
Teaching Grants	<u>54</u>	<u>10,975,250</u>	<u>27</u>	<u>4,971,250</u>
TOTAL	164	41,610,009	49	9,864,671

With the support of the Capacity Building Program, the University of Arkansas, Pine Bluff will enhance its library resources in conjunction with the development of a bachelor's degree program in Regulatory Science. A collaborative project between Tuskegee University, Cook College (Rutgers University) and private industry will develop an innovative program to strengthen training in chemistry for students majoring in the food and agricultural sciences. Aquaculture research is underway at Kentucky State University to examine alternative production technologies that will have mutual benefits to the university and the rural community while minimizing environmental impact. Alabama A&M University is conducting research in the area of plant biotechnology to investigate, at the molecular level, the basis of tolerance to aluminum stress in soybean (*Glycine max* L.) and develop genetic resistance to aluminum toxicity which would be a valuable contribution

to agriculture. These are just a few examples of how the program is advancing the quality of teaching and research at the 1890 Institutions.

SPECIAL RESEARCH GRANTS

The Special Research Grants program concentrates on problems of national and local interest beyond the normal emphasis in the formula programs. The objectives of this program are to facilitate or expand promising breakthroughs in areas of food and agricultural sciences of importance to the Nation and to facilitate or expand ongoing State-Federal food and agricultural research programs.

Following is a description of current activities and selected examples of accomplishments supported under this appropriation item.

CURRENT ACTIVITIES

In FY 1994 under the Special Research Grants program, grants will be awarded to the headquarters and four regional leader laboratories (New York, Michigan, Florida, and California) to continue the pesticide clearance and minor use animal drugs research programs. Regional/National impact grants will also be awarded in a number of other areas including water quality, global change, integrated pest management, pesticide impact assessment, energy biomass/biofuels, and the National Biological Impact Assessment Program.

In FY 1993, selected Special Research Grants were awarded competitively. Listed below are details on the number of proposals submitted and grants awarded.

<u>Specific Area of Inquiry</u>	<u>Number of Proposals Submitted</u>	<u>Amount Requested</u>	<u>Number of Grants/ Agreements Awarded</u>	<u>Amount of Awards</u>
P.L. 89-106:				
Aquaculture	15	\$2,152,087	3	\$298,356
Integrated Pest Management	68	5,649,379	66	4,208,133
Water Quality	239	32,732,295	81	8,369,880
P.L. 97-98:				
Rangeland	32	2,360,165	6	452,869

SELECTED EXAMPLES OF RECENT PROGRESS

Global Change. The UV-B monitoring network has advanced beyond developing criteria for sites at which monitoring instruments will be located. Letters of solicitation were sent to a wide variety of potential cooperating organizations. Responses received have been reviewed by a site selection committee and visits to the most promising sites are being conducted to determine suitability. Several broadband instruments have been purchased and tested to serve in the interim period until the research caliber instruments are available. The research instruments being developed are expected to begin being delivered in early 1994. Early comparison of these instruments with others of high quality indicated the new instrument is indeed superior. Colorado State University is managing this network for USDA, starting with three sites in cooperation with the Department of Energy Quantitative Links Network sites in Illinois, Maine, and Ohio. Cooperative ties have been established with proposed monitoring networks to be established by the Environmental Protection Agency, and with the existing National Science Foundation and Canadian networks.

Water Quality. Agricultural scientists at the University of Arkansas and Texas A&M University examined the impact of surface-applied poultry litter on water quality. They found that applying the poultry litter at the recommended "Best Management Practice" rate resulted in no contamination of groundwater. They also found that incorporation of poultry manure into the soil and spreading it when there was a low probability of rainfall reduced nitrate, bacteria and carbon loading of surface runoff water. However, these same practices had limited effect on reducing runoff phosphorus concentrations, and could contribute to surface water eutrophication. Also, this study showed that the insecticide Cyromazine has a high potential to be transported in runoff, when land applied, but could be dramatically reduced if allowed to dry after application. Thus, current recommended "Best Management Practices" for applying poultry litter to land can protect groundwater quality, but additional practices are needed to prevent contamination of runoff. This research has shown that poultry growers benefit from the use of "Best Management Practices" that make efficient use of poultry manure as a fertilizer while protecting water quality.

Scientists at Mississippi State University, the University of Tennessee, and the USDA Agricultural Research Service at Ames, Iowa are studying the impact of cotton irrigation on the movement, persistence and carryover of herbicides in soils. Their studies with various rates of the herbicide fluometuron under different levels of sprinkler irrigation have shown little or no downward movement of fluometuron through the soil profile, and that degradation of the herbicide was more rapid under high levels of irrigation, especially in a silt loam soil. This research has resulted in development of a new rapid and sensitive method which will greatly reduce the time required to detect fluometuron in soil.

The Iowa Management System Evaluation Area includes evaluation of alternative farming practices. If alternative production practices are to be adopted by farmers, without government intervention, they must offer comparable rates of return to current practices. Two alternative practices are being evaluated as part of a pilot project-- vegetative filter strips (VFS) and ridge tillage. The VFS practice requires little change in management or machinery, but income from the strip is lost. Ridge tillage requires significant changes in machinery, management and production skills. Most of the research to date has focused on the VFS practice. Findings to date show that VFS offers a cost effective means of reducing sediment delivery to surface waters. The efficacy of the VFS practice varies widely within and across watersheds. For example, annual costs to reduce sediment delivery ranged from \$1/ton to \$100/ton within a 1,000 acre watershed. The private costs of the VFS practice is strongly influenced by federal farm program provisions, especially income supports and set-aside requirements. Economic evaluation of farming practices to maintain or improve water quality is important to farmers, community leaders, planners and researchers. Evaluation plays a critical role in technology development, technology transfer and public policy.

Pesticide Impact Assessment. The CSRS component of the USDA's National Agricultural Pesticide Impact Assessment Program (NAPIAP) funds a wide range of research in each state. In the assessment process, one of the areas where good data is always lacking is the area of benefits of pesticides to the system being studied. EPA has had great difficulty when attempting to determine pesticide benefits because of the lack of uniformity of methods across the many data sets they must analyze.

One significant accomplishment is a comprehensive tomato-disease database being developed by CSRS utilizing the expertise of scientists in the State Agricultural Experiment Stations. This database offers the opportunity to address nearly any type of production question that could be asked regarding tomatoes and fungicides. Additionally, new data that will be added as a result of NAPIAP funding provides the opportunity for more refined analyses.

These data provide quantitative, scientifically-sound measures of tomato quality and yield under defined management programs. Further, this project will serve as a model for future crop/pest management strategies for which quantitative measures of benefits are needed.

Tomatoes and fungicides were selected as a model system because of the crop value and because fungicides are an integral part of commercial tomato production. A working group consisting of one tomato-disease scientist from each region, plus an agricultural economist, was convened to identify specific disease problems that could be addressed and to develop protocols for conducting the research. The agricultural economist was included to assure data would be suitable for economic analysis. EPA and USDA scientists serve as ad hoc members of a working group to maintain the database.

National Biological Impact Assessment Program (NBIAP). The National Biological Impact Assessment Program of the Cooperative State Research Service, has released a database of environmental assessments for field tests of genetically engineered plants and micro-organisms. The database is being distributed as a compact disc-read only memory (CD-ROM) to interested users to facilitate the evaluation of safety decisions made through the USDA's permit process under the Federal Plant Pest Act. The Environmental Assessments contained in the database are indexed and cross-inventoried so that specialized software can quickly retrieve information from the volumes of text contained on the CD-ROM. The purpose of distributing this information is to assist scientists in learning from past experiences when designing safe experiments with genetically modified organisms, and to provide easy access to those outside the government decision-making process with information used in making those decisions. This program is operated by Virginia Polytechnic Institute and State University.

Aquaculture. Scientists at Oregon State University have developed an effective delivery system for oral vaccines used in the immunization of trout and salmon. The research was based on the development of enteric-protected vaccines that essentially protect the vaccine from digestion in the stomach, but allow absorption of the vaccine in the intestine of fish. Using this innovative delivery system, researchers have been able to induce serum antibody responses and have demonstrated that this is an effective mechanism for oral immunization of trout and salmon. Vaccine trials are underway using this approach for a number of important diseases in the aquaculture industry.

Tropical/Subtropical Research. Scientists at Guam have worked on the biology and control of the pumpkin beetle, a serious pest. Research has shown that pumpkin beetles prefer to deposit their eggs in soil that is not acidic and has some organic matter. As an alternate host, watermelon was not as good as pumpkin. Corn, sweet potato, and bittermellon were not alternate hosts as has been reported elsewhere. However, zucchini, honeydew and cantaloupe were good host plants. In an effort to reduce insecticide use, various plastic mulches were tried, but they were not effective. Tests with insecticides showed that cabaryl was effective in controlling pumpkin beetles. Research to see how little insecticide could be used showed that spraying one row out of every four reduced beetles by 90%.

Clearance of Pest Products. Historically there has always been a lack of pest control products available for use on minor crops. Commercial registrants traditionally seek major markets for their products and label uses that can be justified on the basis of economic returns. Interregional Research Project Number 4 (IR-4/NRSP-4) is a national program that provides assistance in establishing tolerances and registrations for both conventional and biologically-based pest control products for use on minor food and ornamental crops. The Project, which receives federal funds from USDA-CSRS and USDA-ARS, was established in 1963. It operates through a network of regional leader laboratories and state and federal liaison representatives and is coordinated

by a headquarters located at the New Jersey Agricultural Experiment Station. IR-4 is the only publicly supported research program in the United States created to register pest control products for minor uses.

IR-4 has directly supported more than 50% of the pesticide registrations on minor crops since 1970. In 1993, IR-4 sponsored research on 201 minor food use clearances. Of these, 159 were for new registrations and 42 were for reregistrations. Additionally, IR-4 data were used by commercial registrants to add 40 new ornamental species to three labeled pesticide products. IR-4 also sponsored research on additional ornamental crops. These data will be used to support 290 new registrations for pest control products on commercially grown ornamentals. IR-4 submitted petitions to EPA for two biologically based pest control products in 1993 and funded research on the biological control of dodder, a parasitic plant, utilizing a formulated product containing two species of fungi.

IR-4 plans to conduct research in 1994 on 337 food crop clearance requests involving about 850 field trials. One-third of these will be for the reregistration of currently registered products. Additional research is planned for 330 ornamental clearance requests involving 430 field trials. IR-4 will assist in developing additional toxicology data required by EPA to support a Codling Moth Granulosis Virus petition. IR-4 also will provide technical assistance for the commercial development of Pseudomonas sp for the control of post harvest fruit rots on apples and pears.

Integrated Pest Management. The regional IPM goal is to develop and implement economically sound and environmentally safe methods for managing local pest problems. Component research on specific pest biologies are being incorporated into IPM systems for managing crop pests in multiple cropping systems. Some highlights of the research and recent extension/research implementation programs follow:

In the Western Region numerous successes have been made by the State Agricultural Experiment Stations. For example, in Arizona, scientists are tracking crop jumping, flight habits, and population build-up of the sweetpotato whitefly, a pest that causes millions of dollars in crop losses in western and southern states. In Oregon, continuing research shows that reduced irrigation suppresses potato early dying. In Colorado peach trees benefiting from nematode control methods produced a crop four times larger than trees that received no pest control help. In Washington, scientists are using green manure crops to control nematodes and weeds in potato fields. In Montana, scientists are expanding their arsenal of biological control agents to control pathogens of sweet corn. A team of six researchers is increasing our knowledge of Russian wheat aphid biology and damage, and is developing a software program that will help growers identify aphids and make the right decisions about controlling them.

In the Southern Region, Louisiana scientists are studying the migration and invasion pattern of the velvetbean caterpillar. Knowing the source areas will allow low population densities to be controlled with biological pesticides. Scientists from Virginia, Georgia and Texas are combining pheromones with mechanical control to hold the Southern Pine Beetle in check. This pest has caused hundreds of millions of dollars of damage to timber and pulpwood each year. In Virginia and North Carolina, scientists have used predators and parasites to control up to 95% of the filth flies in poultry houses. In Arkansas and Missouri, scientists are searching for a strain of an endophyte that would retain its ability to give drought and pest resistance to tall fescue, but would not produce the toxin (which impedes cattle growth) usually associated with the endophyte. In Kentucky, scientists are developing methods to spread a virus that infects corn earworms. This pest attacks corn, soybeans, cotton, and vegetables resulting in substantial losses each year.

In the North Central Region, Kansas scientists are studying methods to control field bindweed (a serious pest of wheat, corn, and soybeans) with the use of a moth introduced from the Mediterranean. In Ohio and Wisconsin, scientists are developing methods of controlling the Colorado Potato Beetle by increasing overwintering mortality, minimizing dispersal rates, and identifying crop barriers to the beetle. In Iowa, research and extension scientists are implementing a strawberry pest management program using a nonpathogenic fungus to control another fungus, corn gluten meal to control weeds, and parasitic wasps to control a variety of insect pests. In Wisconsin, research and extension scientists from several disciplines are implementing a Potato Crop Management program which includes rotation schedules, nutrient management, disease management, irrigation schedules, and insect and weed control information.

In the Northeast Region, Maine scientists are studying crop rotation, tillage methods, and insects that eat weed seeds as possible non-chemical methods to inhibit weed growth in potatoes. In New York and Pennsylvania, scientists are developing methods to control several insect pests of alfalfa by the use of nematodes that attack these insects, but do not damage crops. In Maryland, scientists are developing an alfalfa-oat intercrop system to reduce the impact of leafhoppers and weeds. In Vermont, scientists are developing crop management systems to overcome the combined effects of insect damage, disease, and stress from cold temperatures in alfalfa. In New York, parasites are being proposed as an alternative to chemical control of leafhoppers on grapes in a system that utilizes pheromones for the management of grape berry moth.

Supplemental and Alternative Crops. The guayule program has two major components: breeding/genetics and product/market development. In genetics, natural rubber yield has been doubled over the past decade, reaching 8 to 10 percent of the plant biomass. In product/market development, truck tires manufactured by Bridgestone/Firestone are undergoing endurance testing at the U.S. Army Yuma Proving Ground, Yuma, Arizona, and tires for the Navy A/F-18 aircraft are under development by Goodyear. An intensive project is underway mainly at the University of Southern Mississippi and the University of Arizona to identify, characterize, and purify bioactive guayule resin compounds which show significant activity as antifoulants (barnacles) and termatocides.

The High Erucic Acid Development Effort (HEADE) achieved a major milestone in 1993 as the 60,000 acres of crambe production in North Dakota plus industrial rapeseed production mainly in Idaho are displacing a significant portion of industrial rapeseed oil imports from Europe. The program now intensifies product development and market expansion projects to make agricultural production of both crops demand driven by domestic and international manufacturing needs. Rapid progress is most evident by HEADE cooperators' funding product/market development projects through the USDA Alternative Agricultural Research and Commercialization Center and through the Advanced Materials from Renewable Resources program, a joint program between the USDA Office of Agricultural Materials and the Department of Defense, U.S. Army Natick Research, Development and Engineering Center, Natick, Massachusetts. Agronomic work continues to improve reliability of supply and yields by addressing winter kill and pest problems and fitting crambe and rapeseed into profitable and sustainable rotations.

Sustainable Agriculture Research and Education (SARE). The SARE program awards research and education grants through four regional administrative councils with farmer and rancher, non-profit organization, agribusiness, government, and academia representation. From FY 1988 through FY 1992, the program received over 2,000 proposals requesting approximately \$215 million. During this period, a total of 234 regional projects were funded at \$25.3 million, including 45 projects funded in FY 1991 and 1992 through the companion Agriculture in Concert with the Environment (ACE) program with the U. S. Environmental Protection Agency (EPA). Both programs give the highest

priority to integrated system projects which deal with whole-farm system analysis. In addition to meaningful farmer or rancher involvements, most projects have both research and education components.

The National Sustainable Agricultural Advisory Council (NSAAC) was established in 1993 by the Secretary of Agriculture to provide guidance on multiple aspects of sustainability across all USDA agencies. The SARE program, on behalf of the USDA-Cooperative State Research Service, provides the administrative link between NSAAC and the Secretary. The first meeting of the Council was held in the summer of 1993.

In the Northeast Region SARE, New Jersey scientists found that farmers can reduce nitrogen fertilizer rates by an average of 50 pounds per acre by adopting a new soil test for nitrogen, while still maintaining crop yields. This could translate to a \$41 million per year savings and application of 137 million pounds less nitrogen fertilizer in the Mid-Atlantic area. Massachusetts and Vermont led an effort to strengthen collaboration among more than 60 farmers and agricultural professionals from eight Northeast states to overcome barriers to sustainable production and marketing. Participating growers then share their knowledge with others. Crop rotations that control dagger nematodes and soil-borne diseases in tree fruit and eliminate current soil fumigation practices have been identified by Pennsylvania and West Virginia scientists.

In the Southern Region SARE, Texas researchers studying conventional and sustainable livestock and crops systems have shown that low-input corn production systems can produce yields comparable to conventional production with 75% less herbicides, 50 to 75% less nitrogen fertilizer, and 75% less insecticides. Use of winter legumes to encourage beneficial insect predators and parasites for pest control, and to supply nitrogen as a green manure in pecan orchards have been evaluated in Oklahoma and Georgia. This system can reduce insecticide applications by 2/3 and eliminate commercial fertilizer nitrogen applications. Cover crops have also been found to enhance biological control of pests in vegetable crops and reduce soil erosion in Pennsylvania, Oklahoma, Arkansas, and Alabama. CROPS, the Crop Rotation Planning System for Whole-Farm Environmental and Economic Planning, is being developed in Virginia, and when completed, will be available to farmers to analyze economic and environmental consequences of farm operating decisions. The Southern Region SARE also sponsored a Forum on Sustainable Agriculture to discuss program improvements with other organizations including the National Pork Producer's Council, Southern Sustainable Agriculture Working Group, National Cattleman's Association, American Forestry Council, and the Farm Bureau Federation.

In the Northcentral Region SARE, Michigan and Pennsylvania found that chickens could be used to reduce vegetation in apple orchards as efficiently as herbicides and to reduce harmful insect populations while providing a secondary income. Net economic return on crops for no-chemical dairy products was 56% more per acre than conventional counterparts in Minnesota and Wisconsin. In Iowa, bankers, local business people, producers, and local government representatives are conducting on-farm research and hosting local programs to educate producers on the best options for cropping and grazing Conservation Reserve Program (CRP) acreage when it is returned to production. Also in the Northcentral Region, producer grants were awarded to help farmers and ranchers identify problems and find solutions to problems they encounter in implementing sustainable agriculture. Topics of this future research effort include rotational grazing, sugarbeet production, biological weed control, and equipment modification.

In the Western Region SARE, farm improvement clubs disseminated information about sustainable agriculture and built a sense of community in rural areas of Montana. California farmers provided management guidance to scientists

studying tomato production systems and found that organically managed soils suppressed major root diseases and maintained tomato yields. Sheep were used successfully in orchard floor management to replace pesticides and fossil fuels, reduce compaction and increase water penetration in Washington. Similar results were found in Hawaiian macadamia orchards and in a geese-weeder project in Alaska. Utah, Oregon, Montana, and Washington found that winter wheat leaf spot disease could be reduced if no nitrogen fertilizer were applied. The disease can be further minimized by using a wheat/pea rotation as compared to wheat/fallow and continuous winter wheat. Studies in Montana and Wyoming have shown that use of hay and green manure in rotations can stabilize income and create a new market for up to 150,000 tons of seed.

Aquaculture Centers. At the Northeastern Regional Aquaculture Center (NRAC), scientists and extension specialists from Massachusetts, Maine, Rhode Island, New York and Maryland have worked together developing semi-moist diets for feeding to Atlantic salmon using dogfish processing wastes. Preliminary results indicate ingestion, growth and conversion rates using acidified dogfish hydrolysates are comparable to commercially available control diets. Although these results represent work performed in a small-scale research setting, they are sufficiently promising that the investigators are now working toward development of commercial scale field trials of the prototype diets. Dogfish waste is a byproduct of the processing of dogfish and a disposal problem for processors. Presently, the waste is hauled to burial sites at a significant cost. The possibility of including the wastes in aquaculture feeds would result in significantly lower cost diets for the commercial salmon aquaculture industry.

At the North Central Regional Aquaculture Center (NCRAC), scientists from Illinois, Iowa, Michigan, Minnesota, Nebraska and Wisconsin, have been working on reducing constraints to walleye aquaculture. Walleye are a highly desired sport and food fish in the North Central region. Scientists have been able to manipulate the reproductive cycle and can now induce out-of-season spawning in captive walleye brood stock. They have also developed husbandry practices to alleviate noninflation of the gas bladder, a major limiting factor in the successful production of walleye fingerlings grown under intensive culture conditions.

A collaborative project supported by NCRAC scientists from Illinois and Michigan has resulted in the production of triploid sunfish. These fish, which should be functionally sterile, should not divert energy to reproductive products, thus reducing the required energy input (i.e., feeds) by the fish farmer for maintenance and growth. This should translate into significant savings to the aquaculturist since feed costs are typically 50% of a farm's variable production costs.

At the Southern Regional Aquaculture Center (SRAC), there were several developments in 1993. An Aquaculture Safety Forum was held February 2-4, 1993, bringing together approximately 45 scientists from 11 states and others interested in food safety issues and to assess relevant data available on the safety of aquacultured foods. Two products came from the Forum: (1) a 157-page published Proceedings of the Aquaculture Products Safety Forum of all formal presentations and written transcription of the working groups, and (2) a 60-minute live, interactive satellite video-conference which was broadcast nationwide and highlighted the objectives and recommendations developed by the fishery product professionals who participated in the Forum. A review of industry and government sources was undertaken to assess the food safety of Southern aquacultured products and showed that cultured fish represent the safest source of muscle protein and related nutrients among all muscle foods produced in the United States.

SRAC scientists from Louisiana, Alabama, South Carolina, Tennessee, Mississippi and Georgia demonstrated that a turbine pump has potential as an alternative to the standard lift net for loading catfish. The pump loads

catfish much faster and may be an effective device for loading market-size catfish to be sent to processing plants or pay-lakes, or for fingerling catfish to be restocked for grow-out. The turbine pump does not have any adverse physiological effects on the catfish, and physical damage is insignificant. A water displacement method, which minimizes physical and physiological stress on fish in weight determination, was demonstrated to be an accurate and effective method for determining the weight of large amounts of catfish loaded into hauling tanks. Crawfish harvesting research has determined that a rotational trapping system, in which only a portion of the pond is trapped weekly, may have potential in reducing trapping efforts and expenses with little to no decrease in yield from conventional 5-day or 3-day per week harvesting.

Approximately 150 research publications and extension fact sheets, and ten videos have been completed from SRAC regional projects. All 50 states and at least 5 territories have access to these publications, and it is estimated that over 100,000 users receive fact sheets and/or videos annually.

At the Western Regional Aquaculture Center, scientists from California, Idaho, Oregon and Washington have developed and tested a successful vaccine against the IHN virus, which affects commercial trout and salmon stocks. The disease has been identified as the most important biological constraint to the profitability and continued growth of the commercial coldwater aquaculture industry in the western U.S. Losses to the virus cost farmers millions of dollars per year. The vaccine has been commercially licensed and large-scale field trials are underway. In addition, commercial interest has been expressed in several other products from this project, including the monoclonal antibodies, DNA probe, and primer set for the polymerase chain reaction. These are powerful tools that will improve the speed and precision of IHN virus detection and will be of enormous assistance in improving our understanding of the virus carrier state and providing important information about the antigenic and biochemical variation among strains of IHN virus.

The rapid growth of the aquaculture industry is also creating the need for alternate protein sources of consistent high quality for practical feed formulations. The Western Region's investigators in Idaho, California, Montana, and Washington, have demonstrated that wheat gluten can replace more than half of the fish meal in commercial salmon and trout feeds, which will stimulate the wheat industry to expand production of low-cost, animal grade wheat gluten. Additionally, the positive results obtained by use of rapeseed protein concentrate in place of fish meal in salmon and trout feeds is expected to encourage commercial production of rapeseed protein concentrate in North America.

At the Tropical and Subtropical Regional Aquaculture Center, scientists from Hawaii, Arizona, and New Jersey have secured FDA approval for the use of formalin to treat juvenile shrimp affected by protozoan disease. Three years of technology development by scientists and extension agents from the Federated States of Micronesia (Pohnpei and Kosrae) led to the startup of four new commercial bath sponge farms in Micronesia.

HIGHER EDUCATION

In FY 1993 the Department conducted three higher education programs and started development of a new program to begin in FY 1994. The USDA National Needs Graduate Fellowships Grants Program awarded grants to colleges and universities to stimulate the development of food and agricultural scientific expertise in targeted national needs areas. The Competitive Institution Challenge Grants Program, open to all colleges and universities, provided funding to stimulate and enable colleges and universities to provide the quality of education necessary to produce graduates capable of strengthening the Nation's food and agricultural scientific and professional work force.

The Morrill-Nelson Permanent Appropriation provided approximately \$50,000 to every State and territory to advance the quality of teaching programs in the food and agricultural sciences at land-grant universities. The Higher Education Multicultural Scholars Program is being designed to attract and educate more minorities for careers in agriscience and agribusiness in order to increase the ethnic and cultural diversity of the food and agricultural scientific and professional work force and advance the educational achievement of minority Americans.

CURRENT ACTIVITIES

In FY 1993, funds were appropriated to support 63 new doctoral fellows through the USDA National Needs Graduate Fellowships Grants Program. This is the only Federal program targeted specifically to the recruitment and training of predoctoral students for critical food and agricultural scientific positions. It represents a national investment strategy to attract diverse and talented U. S. students to pursue advanced degrees in the food and agricultural sciences. Master's enrollments in the agricultural sciences decreased steadily through the 1980's and appear to have stabilized at just above 10,000. Although fairly stable, doctoral enrollments in the agricultural sciences remain at approximately 10,000. Further, projections on the availability of expertise in the food and agricultural sciences suggest shortfalls in several employment categories.

Fiscal year 1993 was the third year funds were available for the Competitive Institution Challenge Grants Program. Supported projects address regional, national, or international higher education issues; involve creative and novel approaches to teaching that can serve as models; and foster partnership initiatives across the university science and education community, as well as between universities and the private sector. The program requires dollar-for-dollar nonfederal matching funds.

Legislative authority for the administration of funds appropriated pursuant to Morrill-Nelson legislation was transferred to the U. S. Department of Agriculture and targeted to the food and agricultural sciences by the Food and Agriculture Act of 1981. The program was formerly administered by the Department of Education and is considered a permanent appropriation.

In preparing to launch the Higher Education Multicultural Scholars Program, the Department interacted with colleges and universities across the Nation and received strong support for the program. Guidelines for operating the program are well underway and formal regulations are being developed. This department-wide initiative will be open to all U.S. colleges and universities with baccalaureate and higher degree programs in agriculture, natural resources, forestry, veterinary medicine, home economics and closely allied disciplines. The program will provide competitive undergraduate scholarships grants to eligible institutions to attract, educate and graduate outstanding minority students.

SELECTED EXAMPLES OF RECENT PROGRESS

National Needs Graduate Fellowships Grants

Approximately \$3.4 million were available in fiscal year 1993 to fund the National Needs Graduate Fellowships Grants Program. New grants were awarded to colleges and universities to support 63 new doctoral fellows in three targeted national needs areas (Biotechnology--Plant; Engineering--Food, Forest, Biological, and Agricultural; and Water Science).

The new doctoral fellows supported via FY 1993 grants are presently being recruited and can thus be expected to graduate mid to late 1998. The recruitment and training of outstanding doctoral scientists requires

considerable time. This fellowship program helps to minimize these lengthy time requirements by readily attracting academically outstanding students and by enabling them to pursue full-time graduate studies and complete their degree programs as quickly as possible.

Competitive Institution Challenge Grants Program

In FY 1993, approximately \$1.4 million were available under the Competitive Institution Challenge Grants Program to support projects which addressed the undergraduate level of study in the following targeted need areas: (1) curricula design and materials development; (2) faculty preparation and enhancement for teaching; (3) instruction delivery systems; and (4) student experiential learning. A total of 61 different institutions submitted 110 proposals for funding consideration. Funds were available to support a total of 23 grants based on peer review deliberations. The 23 grants were awarded to 18 institutions in 17 states. Some projects supported in FY 1993 will develop interactive, computer-based instruction modules in areas such as veterinary anatomy, animal science, and woody plant identification. Other projects will develop opportunities for students and faculty to gain valuable experiences in international agriculture. Diversity issues will be addressed by the program through projects to encourage minority participation in the food and agricultural sciences and projects to enhance the awareness of faculty and students toward diversity issues. Other projects address the decision case study approach to teaching, agricultural ethics for faculty and students, a computer simulation for food processing management, interdisciplinary team teaching to promote global agricultural sustainability, and an electronic textbook in plant pathology.

Morrill-Nelson

The latest data available denotes use of Morrill-Nelson funds for faculty salaries, teaching equipment, program development and other operating expenses. Administrative units having access to and reporting use of the monies to strengthen higher education in the food and agricultural sciences include agriculture, home economics, forestry, and veterinary medicine.

Higher Education Multicultural Scholars Program

Congress has appropriated \$1.0 million for FY 1994 for the Higher Education Multicultural Scholars Program. This will provide support for the recruitment and four years of education for approximately 40 minority undergraduate students. Stipends for the scholars will cover 75 percent of the students' cost of attendance including tuition, fees, room and board, books and other educational expenses. The remaining 25 percent will be paid by the college or university. Institutions will also receive a \$1,000 annual cost-of-education allowance for each scholar supported by the program.

NATIONAL RESEARCH INITIATIVE COMPETITIVE GRANTS PROGRAM

The original Competitive Research Grants program was initiated by the Department in 1978 to fund basic research in selected high priority areas related to plant production and human nutrition. Basic research initiatives implemented in 1985 encompassed broader research perspectives in plant and animal science and biotechnology. Competitive research grants have complemented the on-going research efforts of the USDA and the traditional agricultural research arena by encouraging the participation of outstanding research scientists throughout the entire U. S. scientific community who have expertise in these areas.

In FY 1991, the Competitive Research Grants Program was expanded into the National Research Initiative (NRI). Research areas were added in natural resources and the environment; plant systems; animal systems; and nutrition,

food quality and health. In FY 1992, two new areas of processing antecedent to adding value to new products and markets, trade and rural development were added to the National Research Initiative. The following is a description of current activities and selected examples of accomplishments supported under this appropriation item.

CURRENT ACTIVITIES

The NRI target areas were identified as those with a high potential for scientific discoveries that will contribute to vitally needed solutions of important agricultural problems. Target areas in natural resources and the environment include water quality, plant responses to the environment, forest/rangeland/crop ecosystems, and improved utilization of wood and wood fiber. The target areas in nutrition, food quality and health address the research area of human nutrient requirements for optimal health and food safety. There are four target areas in animal systems research: reproductive biology, cellular growth and developmental biology, animal molecular genetics and gene mapping, and mechanisms of animal disease. In plant systems the target areas encompass: plant-pest interactions (e.g., pathogens, weeds, insects and nematodes), plant genome, genetic mechanisms and molecular biology, photosynthesis and respiration, and nitrogen fixation/metabolism. Research on alcohol fuels is also supported. The markets, trade, and rural development program area supports research on market assessments, competitiveness and technology and sustainability as well as understanding forces affecting rural areas and designing new approaches to rural development. In the processing for adding value or developing new products area, research is supported on enhancing value and use of agricultural and forest products and on food and non-food characterization/process/product.

The National Research Initiative Competitive Grants Program received 2,893 research proposals in FY 1993 requesting \$576 million for support of research in the targeted areas. From those proposals 790 grants were awarded totaling \$91.8 million. Table 6 provides details on the number of proposals submitted, the number of grants awarded, and the major categories of grant organizations. Table 7 lists recipients of competitive research grants and the dollars received.

SELECTED EXAMPLES OF RECENT PROGRESS

PLANT SYSTEMS

Global Change. The depletion of the stratospheric ozone layer will likely lead to appreciable increases in the amount of ultraviolet-B (UV-B) radiation reaching the earth's surface. Plants may be particularly predisposed to enhanced UV-B damage because leaves are usually positioned to intercept large amounts of solar radiation; it is known that UV-B is deleterious to certain photosynthetic reactions and to nucleic acids, the genetic material of cells.

A scientist at West Virginia University has used a fiber-optic microprobe to determine the amount of UV-B radiation which penetrates leaves of diverse types of plants ranging from evergreens to herbaceous plants to grasses. While the outer epidermal layer of evergreen leaves absorbed essentially all the UV-B before it reached the inner layers of the leaf, the epidermis of many herbaceous plants allowed much of the radiation to penetrate the leaf. The observed large differences in screening ability suggests that certain plant life forms may be more predisposed than others to UV-B damage. An increased understanding of the several leaf biochemical and structural factors which appear important in determining the screening effectiveness and their changes in response to increased UV-B radiation can furnish a basis for predicting potential damage and in selecting plants capable of meeting the challenge of higher UV-B.

Entomology/Nematology. Alternative pest management practices must be sought if the goal of reducing the use of synthetic chemically-based pesticides is to be realized. Biotechnology offers a basis on which alternative pest control strategies can be developed. Investigators at Cornell University (New York) are using genetic engineering to transfer the genetic traits responsible for pest resistance from wild tomato plants to cultivated tomato varieties. The wild tomato plant successfully defends itself from insect attack by producing noxious compounds that are excreted by hairs found on the tomato leaf. Insects are unwilling to feed when this compound is present, thus protecting the plant from insect damage. Detailed studies on the biochemistry and genetics of this system have provided the basic knowledge necessary to transfer this trait to economically important tomato cultivars.

Plant Growth and Development. Corn is an important crop used primarily for animal feed and for providing a major portion of the calories and protein in human diets in many parts of the world. Much of the nutritional value of corn comes from storage proteins in the kernel. During seed germination, these proteins are broken down and used as sources of nourishment by the growing embryo. A research group in the state of North Carolina has recently isolated and characterized a protein that appears to be a key agent in protecting these storage reserves from pests and pathogens. This protein, RIP (Ribosome-Inactivating Protein), is synthesized in an inactive form during seed development. Upon seed germination, RIP is processed to an active form that modifies ribosomes of non-plant organisms (including many plant pathogens) such that their protein synthesis is shut down. Because RIP does not inactivate plant ribosomes, it holds potential as a biocontrol compound. In addition, understanding the biological activity of natural defense agents will facilitate design of efficient strategies for improvement of corn as well as other important crop plants.

Photosynthesis and Respiration. Phycobilins are an important group of plant and algal pigments that function in the collection of light energy that is used in photosynthesis. On a global scale, a large fraction of all photosynthesis is driven by light energy that is collected by phycobilin pigments. Relatively little was known about how phycobilin-containing photosynthetic organisms synthesize these pigments and how they regulate the accumulation and use of the pigments. In research supported by the Photosynthesis/Respiration Program of the NRI, investigators at Brown University (Rhode Island) have discovered how phycobilins are biosynthesized, and are now learning how organisms containing phycobilin control their phycobilin content.

Plant Pathology. Investigators at Cornell University (New York) have developed a new method to generate virus resistant crop plants. Plants transformed with viral enzyme gene sequences become resistant to the virus from which the sequences were derived. The process, termed "replicase-mediated resistance" was discovered with the model system of tobacco mosaic virus in tobacco. Its principal feature is the extreme form of resistance which develops; plants never come down with virus disease, even when inoculated with massive doses of virus. Work is now expanding to include the economically important viruses, cucumber mosaic and potato virus Y. Others have used this technique to generate potato plants resistant to potato viruses X, Y and leafroll. This process enlarges our capacity to produce virus-resistant plants and is a good molecular complement to conventional plant breeding techniques in which resistant cultivars are sought.

Plant Genome. Commercial forestry amounts to a \$49 billion business in the Southeastern United States and is predominantly Loblolly pine farming and related wood product manufacturing. The genetic improvement of Loblolly pine trees has been difficult because they are not easy to breed and often require 5 to 10 years to begin reproducing pollen and seeds. To help overcome this obstacle, scientists at North Carolina State University at Raleigh, have

analyzed the DNA from Loblolly pine and have mapped about 200 genetic markers to the trees' chromosomes in only 60 days. This is currently the most extensive genetic map made of a woody plant which is a major accomplishment for a species whose map had been thought by many to be nearly impossible to delineate. Now breeders can use this information to speed greatly the development of improved loblolly pines by helping them make earlier decisions about which trees to keep so that time and space is not wasted on making crosses and observing offspring.

ANIMAL SYSTEMS

Improving Animal Growth and Development. Efficient growth of fish is critically important in aquaculture since a major expenditure is fish feed. Understanding fish growth and optimizing fish breeding practices will lead to more economic management. Researchers at the University of Washington-Seattle have determined that insulin-like growth factor I (IGF-I), a protein hormone known to be essential in mammalian growth, is present in both juvenile and adult coho salmon. Another group of investigators at Memphis State University (Tennessee) is working with catfish. Since male catfish tend to grow faster and larger than female catfish, this group is developing monosex (all male) populations of channel catfish by selective breeding. In the first year of the study, these workers have identified 15 male fish carrying the YY genotype. At spawning, these fish will produce only male fry.

Sustaining Animal Health and Well-Being. Infections caused by *Escherichia coli* are the most common cause of diarrhea and death in newborn livestock animals. The economic losses per year in the United States are estimated to be in excess of \$100 million. Specific bacterial surface proteins must attach to other specific proteins in the animal's intestine to cause disease. Researchers at the University of Illinois have determined that the production of one key surface protein requires at least eight different bacterial genes. Their continued study of the regulation of these proteins is leading to improved treatments. Investigators at South Dakota State University in collaboration with USDA/ARS National Animal Disease Center in Iowa are studying other proteins critical to *E. coli* induced diarrhea. Two different intestinal receptors were identified that are present only in pigs that are susceptible to *E. coli* produced disease. Researchers are now studying these receptors with the goal of developing a test to distinguish resistant and susceptible animals. Additionally, workers at the University of Washington-Seattle are studying the proteins and receptors that allow certain types of *E. coli* to penetrate the intestine and enter the bloodstream. Their goal is to prevent this penetration so that *E. coli* cannot produce blood-borne infections in animals.

NUTRITION, FOOD QUALITY AND HEALTH

Improving Human Nutrition for Optimal Health. Investigators at the University of Minnesota have determined that dietary copper may be critical to early infant brain and cognitive development. Recent studies by these scientists demonstrated that newborn animals receiving low copper diets had both low copper levels in the brain and significant changes in brain neurotransmitter levels. The low copper levels and altered brain chemistry were not corrected when the animals were later fed diets containing adequate dietary copper. These findings support the concept that adequate levels of dietary copper, like iron, are essential for normal infant brain development and that inadequate levels can result in permanent changes in the brain.

Ensuring Food Safety. Microorganisms are known to contaminate contact surfaces used in food processing, and the dangers associated with consuming foods that are contaminated are well-documented. Naturally occurring antimicrobial proteins produced by those bacteria used to produce cheese from milk exist and are already used in some foods. Researchers at Oregon State

University are studying one of these proteins, called nisin, and are applying it to contact surfaces as a method to reduce bacterial surface contamination. Preliminary results indicate that antimicrobial activity produced by nisin is stable and is maintained even following washing of contact surfaces. If this procedure can be adapted to industrial surfaces, it could result in improved food safety.

NATURAL RESOURCES AND ENVIRONMENT

Forest/Rangeland/Crop Ecosystems. The landscape throughout large areas of the eastern United States is a highly fragmented mix of forest and farm lands. Such fragmentation is known to affect many ecological processes, and could affect the distribution of some organisms that cause decline and mortality in forest tree species. Researchers at State University of New York-College of Environmental Science and Forestry (SUNY-CESF) are studying how characteristics of the landscape (e.g., type of land use, degree of different land use types, composition and structure of vegetation) affect the incidence and rate of spread of a mycoplasmal disease, ash yellows. Ash yellows causes decline and mortality in white ash, a valuable timber species. In central New York, stands of northern hardwood forests of various sizes and distances from agricultural fields are being examined for the mycoplasmas causing ash yellows to determine whether this disease occurs in areas where there is a greater degree of forest fragmentation. White ash trees within these stands have been permanently tagged for future determination of disease spread. The spatial relationships of infected versus non-infected stands have been geo-referenced with the aid of a geographical positioning system. Geographical information systems technology will be used to calculate landscape-level attributes for each study site and to evaluate the importance of site, stand, and landscape variables in relation to disease incidence and spread. Results of this research should lead to ecologically sound management practices for northern hardwood forests affected by ash yellows and should illustrate the importance of host-pathogen-landscape level interactions in natural forests.

Water Quality. Riparian ecosystems, the lands adjacent to streams, rivers, lakes and ponds, can be essential for removal of nonpoint source pollution before pollutants reach the water bodies. In the eastern and southern United States, these riparian ecosystems are often forested wetlands. Although mature riparian forests are known to be effective filters for nutrients and sediment from agricultural lands, scientists need better understanding of the processes of nutrient removal under managed conditions to make better recommendations on managing riparian forest buffers for water quality improvement. Researchers at USDA/ARS and University of Georgia are testing whether interim management recommendations developed by USDA for Riparian Forest Buffers are appropriate for long-term water quality protection. They have determined that a mixed pine-hardwood forest about 50 years old is effective at keeping nutrients and sediment from a corn field from reaching a stream. The merchantable timber has been harvested to within about 30 feet of the stream, and ongoing studies are examining whether this is an effective buffer while the harvested area regrows. The scientists are also looking at how nitrate is removed from shallow groundwater - whether it is removed by plant uptake, microbial uptake, or denitrification (reduction of nitrate to nitrogen gas). Results from study of the mature forest (before timber harvest) show that both denitrification and plant uptake are important to nitrate removal. Results from the management studies will be used to design more effective Riparian Forest Buffers and to refine the existing standards to increase acceptability of these ecosystems as tools for controlling nonpoint source pollution.

Plant Response to Environment. Catastrophic flooding of farm land over extensive areas of the mid-west in the summer of 1993, with destruction of millions of dollars worth of crops, highlighted the constant vulnerability of crops to excess soil water. Less spectacular but equally damaging and much

more frequent is the soil flooding that occurs on poorly draining land after heavy rain, with irrigation or with rising water tables. In all these situations, oxygen from the air fails to reach roots in the water-saturated soil, causing root death and crop failure. Researchers at Texas A & M University are studying how roots of maize adapt to flooding-induced oxygen deficiency, with the aim of discovering ways of making crops more resistant to flooding. These researchers are also identifying genes that are important in improving the survival of maize challenged with this stress. Maize plants use two strategies to cope. In the short term, they increase their rate of anaerobic (absence of oxygen) respiration (fermentation) to generate metabolic energy. In the longer term, they generate new roots that are structurally adapted with internal air channels for the easy movement of oxygen from the leaves (exposed to air) to the root, so that they continue to live. Other related research is attempting to suppress the harmful accumulation of the end product of anaerobic metabolism (lactic acid) which contributes to root death under these conditions. Additionally, by comparing the biochemistry of flood-resistant wild plants with flood-sensitive plants, it may become possible to identify and transfer beneficial genes to various crop plants to help overcome the problems of too much water.

PROCESSING FOR VALUE ADDED

Food and Non-Food Characterization, Process and Product Research. The goal of this program, initiated in FY 1992, is to use agricultural materials more fully and effectively in food and non-food products, including products with enhanced competitive value and quality. Expanded domestic and international markets for bread wheats produced in the United States will depend upon continued improvement in their bread-making quality. A team of scientists at the University of Nebraska is using electrophoresis and digital image analysis to study the protein component of hard red winter wheats, which is the component most responsible for controlling bread-making quality. Information obtained on the effect on wheat variety and growing conditions on protein composition will provide feedback to plant breeders and farmers in selecting and growing wheat with high end-use quality.

Researchers at Louisiana State University are developing processes for extraction of cellulosic fibers from the rind of sugar cane and evaluating the properties of various textile products (yarns, fabrics, and non-woven mats) made from the extracted fibers. This new use for cane fibers in textile and geotextile applications will assist the sugar industry by increasing the value of what is currently a low-value by-product.

Research at the University of Minnesota seeks to overcome the poor processability and inferior properties of natural polymers, such as starch, which prevent their use as environmentally-friendly plastics. The approach is to blend the natural starch with small quantities of reactive synthetic polymer in a batch blender or continuous extruder. The resulting high value-added product will reduce the burden of solid waste on the environment and promote use of surplus agricultural materials.

MARKETS, TRADE AND POLICY

The Eastern European and Former Soviet Union Beef Sectors. A market assessment study at Iowa State University indicates-the region comprising the nations of Eastern Europe and the former Soviet Union will not be a major competition or market for U. S. and other beef producers and exporters in the short or medium terms. The region is enormous in size, in the midst of transitioning to a market economy, and has the potential of becoming a large beef consumer and exporter. However, a number of factors will constrain beef consumption and trade. One, poor economic conditions will cause beef consumption by these nations to decline faster than beef production, resulting in the build up of stocks. Two, exportation of this surplus and development

of export markets is all but impossible because of the presence in herds of Foot and Mouth Disease. Other factors that will limit international trade include lack of a legal and economic infrastructure, unfavorable exchange rates, and government policies that reduce the potential for profits from beef sales.

Rural Development. Research is underway at Auburn University in Alabama that will determine the effect of timber dependency in rural areas of the state and the implications of this dependency for sustaining rural development. A 3-year project funded by the National Research Initiative Competitive Grants Program is examining the impact the forest products industry has on the economic base, quality of life, and infrastructure of selected rural communities. The research will identify potential opportunities for the forest products industry to contribute towards rural revitalization in Alabama. Understanding the effects of timber dependency is vital to ensuring future well-being and improving quality of life in rural areas.

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

The Small Business Innovation Development Act (SBIR), Public Law 97-219, July 22, 1982, as amended by Public Law 99-443, October 6, 1986, was designed to strengthen the role of small, innovative firms in Federally funded research and development. Under this program small firms receive at least a fixed minimum percentage of research and development awards made by Federal agencies with sizable research and development budgets. From FY 1986 through FY 1992, 1.25 percent of an agency's extramural research budget was set aside for purposes of the SBIR Act. The Small Business Research and Development Enhancement Act of 1992 (Public Law 102-564, October 28, 1992) has amended the set-aside percent for the SBIR program as follows: 1.5 percent in fiscal years 1993 and 1994, 2.0 percent in fiscal years 1995 and 1996, and 2.5 percent in each fiscal year thereafter.

The objectives of the Small Business Innovation Research program include stimulating technological innovation in the private sector, strengthening the role of small businesses in meeting Federal research and development needs, increasing private sector commercialization of innovations derived from USDA-supported research and development efforts, and fostering and encouraging participation by minority and disadvantaged small business firms in technological innovation.

The following is a description of current activities and selected examples of accomplishments from this program.

CURRENT ACTIVITIES

In response to the September 1, 1992, deadline announced in the Federal Register, the Department of Agriculture received 381 Phase I proposals from small businesses that had innovative approaches to solve problems in U.S. agriculture. On February 15, 1993, 35 Phase II proposals were submitted by small businesses that had previously received Phase I awards. The agency contributions were pooled and grants were made without regard to the funding source. The proposals were peer reviewed and many high quality applications were identified. With the funds available for the program 76 awards (53 Phase I awards and 23 Phase II awards) could be made. A summary for fiscal year 1993 follows:

<u>Program Area</u>	<u>Number of Proposals Received</u>	<u>Amount Requested</u>	<u>Number of Grants Awarded</u>	<u>Amount of Awards</u>
Forest and Related Resources	44	\$2,421,654	8	\$634,159
Plant Production and Protection .	84	5,092,049	14	1,369,101
Animal Production and Protection.	49	3,331,674	9	888,347
Air, Water and Soils	48	3,151,124	7	642,582
Food Science and Nutrition	47	3,249,473	10	982,630
Rural and Community Development .	51	3,434,723	11	1,168,771
Aquaculture	56	3,325,907	10	825,520
Industrial Applications	36	2,365,859	7	515,650
Animal Science (Reprod. Phslyg.).	<u>1</u>	<u>192,932</u>	<u>0</u>	<u>0</u>
Total	416	26,565,395	76	7,026,760

SELECTED EXAMPLES OF RECENT PROGRESS

Forests and Related Resources. Virtually all lumber must be dried prior to use. This is a very time consuming and expensive operation. The total cost of drying lumber in the United States is estimated to exceed \$1 billion annually. A major problem faced by the lumber industry is drying lumber at the proper rate and to the appropriate moisture content to avoid defect formation and to maximize the cost-effectiveness of the process. What is needed is a better method to monitor the change in moisture content on a continuous basis. An Oregon company has developed a weight-based technology to monitor the moisture content of lumber in a dry kiln. Lumber is stacked on bolsters for drying in the dry kiln. By placing load cells in selected bolsters and connecting them via cables to a computer on the outside of the dry kiln, it is possible to monitor continuously the loss of weight of the lumber and thus the decrease in the moisture content. Successful implementation of this system will permit more accurate monitoring of the rate of drying and the degree of drying and thus save millions of dollars through reduced defect formation and more efficient operation of lumber drying.

Plant Production and Protection. Most aspects of growing nursery plants have been automated, but transplantation of seedlings from seed flats to larger containers continues to be done largely by manual labor. Since more than three billion plants are transplanted annually, improvements in the efficiency of the process could have a substantial impact on the nursery industry. An Indiana company has developed a robotic transplantation system capable of transplanting 10,000 seedlings per hour. The system uses machine vision to detect the seedling and robotic fingers to pick up the seedling plug and transfer it to the larger container. This system represents a large potential savings over the use of manual labor and thus could have a substantial impact on the nursery industry.

Animal Production and Protection. Swine dysentery is a very important disease that is estimated to cost swine producers in excess of \$180 million annually. Confirmation of the disease is based on the detection of the causative bacteria, Treponema hyodysenteriae, from infected pigs. The currently available assay is time consuming, lacks sensitivity, and often requires an experienced technician for an accurate diagnosis. An Arizona company is working to develop an easily interpreted, rapid and sensitive diagnostic assay to detect the bacteria in fecal samples. The procedure of polymerase chain reaction (PCR) is being used to enhance the sensitivity of the assay. Successful development of a PCR-based diagnostic assay for swine dysentery will make it much easier to detect infected animals, including those that are asymptomatic, and eventually will make it possible to completely eradicate the disease from this country.

Air, Water and Soils. Pesticides continue to be of crucial importance to many agricultural production systems. In recent years the dependence upon pesticides has been decreased and new generations of pesticides have been developed that are more specific and less persistent. Nevertheless, pesticide usage leads to the contamination of water, both in terms of unused spray solution and the water used to clean empty containers, storage tanks and sprayers. What is needed is a safe, inexpensive method to destroy these pesticide wastes. A California company has developed a novel electrochemical process that is capable of completely destroying 2,4-D, dimethoate and other water soluble pesticides. The process only requires electricity and sodium carbonate (a very inexpensive, nonhazardous chemical) and produces water that can safely be discharged with no further treatment. Cost estimates indicate that the process is very inexpensive. This process will be particularly effective in destroying small volumes of pesticide-contaminated water that are produced on many farms and at other rural locations.

Food Science and Nutrition. The relationship between the density of potatoes and cooking quality has been known for a long time. Potatoes that are more dense have a higher dry matter content, possess better taste, and give higher yields of chips and french fries with lower oil consumption. Efforts to develop effective methods to sort potatoes on the basis of density have not been effective. Sorting can be achieved in liquid solution, but the problems of liquid contamination and pre- and post-washing procedures have prevented widespread use of this approach. An Idaho company is developing a dry method to sort potatoes on the basis of density by utilizing a fluidized bed medium. In this system a fluidized condition can be achieved by passing a gas through the medium. When objects such as potatoes that possess different densities are added to the system, their movement is a function of their density, making density separation quite feasible. Successful development of a fluidized bed sorter for processing potatoes will greatly help the potato industry since the cooking and processing conditions can be modified to match the particular density characteristics of the potatoes.

Rural and Community Development. Providing affordable care for the elderly is a problem throughout the country, but especially in rural areas where there are fewer facilities providing appropriate care. Adequate child care facilities are also a particular problem in small rural communities. A Vermont company has demonstrated an innovative approach to solving both problems by combining elder care and child care within one intergenerational care facility. They have shown that by combining both elder care and child care, the economics are greatly improved and there are numerous positive interactions between the children and the older people that are mutually beneficial. This study has shown that an intergenerational care facility in a non-institutional setting (e.g. a home) offers significant revenue-generating opportunities for the care providers. It also provides enhanced care for both elders and children because the interactions between the two groups prove to be mutually beneficial.

Aquaculture. Sea cucumbers are considered a delicacy in many cultures, especially those in the Far East. Within the United States there is considerable demand for them in Hawaii and on the West Coast. They are sold either dried, pickled or fresh. There is no aquaculture industry for sea cucumbers, and thus, they are collected in the wild. This has resulted in considerable overfishing of native stocks of sea cucumbers in many parts of the world. In an effort to overcome this problem, a Hawaii company is developing aquaculture procedures for the production of one of the native Hawaiian sea cucumbers, Stichopus japonicus. They have developed successful and reliable year round techniques for spawning induction and mass larval rearing, and have made good progress in developing nursery and growout procedures. The successful development of aquaculture procedures for raising S. japonicus in Hawaii will greatly increase the availability of fresh and dried sea cucumbers, will alleviate the pressure on the native populations of

S. japonicus in Hawaii, and will present important new export potential to Japan and other countries in the Far East.

Industrial Applications. In recent years the production of fuel ethanol from corn and other agricultural crops has become an important new industry. In the process of producing ethanol, a large volume of an aqueous stream known as stillage is produced. Stillage contains considerable amounts of solids, as well as important chemicals such as butanol, lactic acid, acetic acid, citric acid and glycerol. At present, centrifugation and conventional filtration are used to process the stillage for recovery of the solids and organics. A Massachusetts company is developing an alternative approach to processing stillage through crossflow microfiltration using ceramic membranes. They have developed an economical ceramic module design, which will substantially reduce the cost of the membranes, and procedures to make the membranes non-fouling. Successful development of economical, non-fouling ceramic membranes for treatment of fuel ethanol stillage will improve the economics of fuel ethanol production by producing solids for use as animal feed and specialty chemicals for use in the chemical industry.

COOPERATIVE STATE RESEARCH SERVICE

The estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets):

[Buildings and Facilities:]

[For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities and for grants to States and other eligible recipients for such purposes, as necessary to carry out the agricultural research, extension, and teaching programs of the Department of Agriculture, where not otherwise provided, \$56,874,000, to remain available until expended (7 U.S.C. 2209b).]

No funding is proposed for this program in fiscal year 1995.

COOPERATIVE STATE RESEARCH SERVICE

BUILDINGS AND FACILITIES

Appropriations Act, 1994	\$56,874,000
Budget Estimate, 1995	- -

Decrease in Appropriations	-56,874,000
	=====

SUMMARY OF DECREASE

Item of Change -----	1994 Estimated -----	Program Change -----	1995 Estimated -----
Buildings and Facilities	\$56,874,000	-\$56,874,000	- -
	=====	=====	=====

PROJECT STATEMENT
(On basis of appropriation)

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
ALABAMA:							
Wallace State Junior							
College Wellness							
Center	(a)		- -		- -	- -	
ARIZONA:							
Agric. Research Com-							
plex-Envir. Stress							
Lab, University of							
Arizona, Tucson ...	\$1,100,000		\$800,000		-\$800,000	- -	
ARKANSAS:							
Agriculture Building	- -		1,775,000		-1,775,000		
Ctr. for Alter. Pest							
Control Research,							
Univ. of Arkansas	- -		1,000,000		-1,000,000	- -	
Poultry Center for							
Excellence, Univ.							
of Arkansas	3,189,000		- -		- -	- -	
Livestock Research &							
Activity Complex ..	(a)		- -		- -	- -	
CALIFORNIA:							
Altern. Pest Control							
Containment and							
Quarantine Fac.,							
Univ. of CA.	385,000		2,219,000		-2,219,000	- -	
Grape Import. Facil.							
Univ. of CA., Davis	2,191,000		- -		- -	- -	
COLORADO:							
Animal Reproduction							
Biotechnology.							
Colorado State Univ.	(a)		340,000		-340,000	- -	
CONNECTICUT:							
Ag Biotechnology							
Lab. Univ. of CT ..	- -		(a)		- -	- -	
DELAWARE:							
Poultry Biocontain-							
ment Laboratory	(a)		350,000		-350,000	- -	
FLORIDA:							
Ag. Biotech. Inst.,							
Univ. of Florida ..	- -		276,000		-276,000	- -	
GEORGIA:							
Biocontainment Facil.							
Univ. of Georgia ..	- -		1,793,000		-1,793,000	- -	
Ctr. for Advanced							
Water Technology.							
Savannah State Col-							
lege	376,000		213,000		-213,000	- -	
Nat. Lab. for Envir.							
Sound Prod. Ag.,							
Univ. of GA., Tifton	1,293,000		- -		- -	- -	
Vidalia Onion Storage							
Research Facility.							
Univ. of GA., Tifton	194,000		- -		- -	- -	
Center for Rural							
Health & Epidemi-							
ology, Georgia							
Southern University	(a)		- -		- -	- -	
HAWAII:							
Ctr. for Tropical &							
Subtropical Agric.,							
Univ. of Hawaii ...	3,311,000		- -		- -	- -	
Center for Applied							
Aquaculture	- -		2,219,000		-2,219,000	- -	
IDAHO:							
Biotech. Facility.							
Univ. of Idaho	500,000		1,319,000		-1,319,000	- -	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff Years
ILLINOIS:							
Biotech. Center.							
Northwestern Univ..	\$517,000		\$888,000		-\$888,000	- -	
INDIANA:							
Molecular & Cellular							
Biotech. Facility,							
Indiana University	2,155,000		300,000		-300,000	- -	
IOWA:							
Trade Marketing							
Center	(a)		- -		- -	- -	
KANSAS:							
Plant Science Ctr..							
Kansas State Univ.	1,353,000		1,200,000		-1,200,000	- -	
KENTUCKY							
Applied Research and							
Man Power Training							
Center	- -		(a)		- -	- -	
LOUISIANA:							
Fish Processing							
Facility	(a)		- -		- -	- -	
Red Meat Processing							
Facility	(a)		75,000		-75,000	- -	
MAINE:							
Presque Isle Farm							
Bldg. Consolidation,							
University of Maine	776,000		- -		- -	- -	
Wood Processing							
Facilities	(a)		- -		- -	- -	
MARYLAND:							
Institute for Nat.							
Resources & Envir.							
Science, Univ. of							
Maryland	862,000		1,776,000		-1,776,000	- -	
MASSACHUSETTS:							
Center for Hunger,							
Poverty, Nutrition &							
Policy, Tufts Univ.	- -		3,389,000		-3,389,000	- -	
MICHIGAN:							
Food Toxicology Ctr..							
Michigan State Univ.	15,010,000		- -		- -	- -	
MISSISSIPPI:							
Biological Technology							
Ctr. for Water and							
Resources, Univ. of							
Mississippi	186,000		100,000		-100,000	- -	
MISSOURI:							
Meat Science & Safety							
Center	(a)		2,428,000		-2,428,000	- -	
Bioscience Research							
Ctr., U. of Missouri	(a)		- -		- -	- -	
Center for Plant Bio-							
diversity, St. Louis	- -		(a)		- -	- -	
MONTANA:							
Bioscience Center,							
Montana State Univ.	915,000		1,987,000		-1,987,000	- -	
NEVADA:							
Biochemistry and							
Biology Field Re-							
search Station,							
Univ. of Nevada ...	215,000		250,000		-250,000	- -	
NEW JERSEY:							
Plant Bioscience							
Fac., Rutgers Univ.	2,623,000		2,329,000		-2,329,000	- -	
NEW MEXICO:							
Center for Arid Land							
Studies, New Mexico							
State University ..	(a)		849,000		-849,000	- -	
NEW YORK:							
New York Botanical							
Garden	3,586,090		2,773,910		-2,773,910	- -	
Cornell Univ., Re-							
search Greenhouse	- -		375,000		-375,000	- -	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
NORTH CAROLINA:							
Ctr. for Nutrition.							
Wake Forest Univ.							
Bowman-Gray Center							
Wake Forest Univ...	\$3,684,000		\$3,270,000		-\$3,270,000	- -	
NORTH DAKOTA:							
Animal Care Fac..							
ND State Univ.....	- -		1,775,000		-1,775,000	- -	
Food Processing Pilot:							
Plant, ND State Univ:	- -		750,000		-750,000	- -	
Institute for Agric.							
and Rural Health							
Research Dev., Minot:							
State Univ.....	2,179,000		- -		- -	- -	
Inst/Ag Health							
Science and Rural							
Medicine, Univ. of							
North Dakota	1,864,000		650,000		-650,000	- -	
Seed Research and							
Regulatory Facility:							
ND State University:	431,000		- -		- -	- -	
OHIO:							
Plant Science Re-							
search Facility.							
Univ. of Toledo ...	512,000		- -		- -	- -	
Lake Erie Soil &							
Water Research and							
Education Center ..	(a)		280,000		-280,000	- -	
OKLAHOMA:							
Beef Cattle Research							
Facility	(a)		375,000		-375,000	- -	
OREGON:							
Seafood Center.							
Oregon State Univ..	1,824,000		- -		- -	- -	
Regional Food In-							
novation Ctr..							
Oregon State Univ..	- -		2,663,000		-2,663,000	- -	
PENNSYLVANIA:							
Center for Food							
Marketing, St.							
Joseph's University	- -		7,120,000		-7,120,000	- -	
RHODE ISLAND:							
Bldg. Consolidation.							
Univ. of RI	- -		3,738,000		-3,738,000	- -	
SOUTH DAKOTA:							
No. Plains Biostress							
Lab., SD State Univ.	875,000		- -		- -	- -	
TENNESSEE:							
Nursery Crop Research							
Station, Tennessee							
State University ..	367,000		345,000		-345,000	- -	
Ag., Biological and							
Envir. Research							
Complex, Univ. of							
Tennessee, Knoxville:	797,000		1,775,000		-1,775,000	- -	
Horticulture Public							
Service Research &							
Education Center.							
Middle Tennessee							
State University ..	(a)		287,000		-287,000	- -	
TEXAS:							
Inst. of Biosciences							
& Technology, Texas:							
A&M Univ. at Houston:	603,000		- -		- -	- -	
Southern Crop Im-							
provement, Texas A&M:	(a)		621,000		-621,000	- -	

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
UTAH:							
Biotech Lab. Utah							
State University ..	\$658,000		\$824,000		-\$824,000	- -	
VIRGINIA:							
Agric. Biotechnology							
Facility, Virginia							
Polytechnic Inst. &							
State University ..	880,000		1,469,000		-1,469,000	- -	
WASHINGTON:							
College of Veterinary							
Medicine, Animal							
Disease Biotech Fac.							
WA State Univ.....	2,258,000		5,105,000		-5,105,000	- -	
WISCONSIN:							
Agric. Biotech/							
Genetics Fac., Univ.							
of Wisconsin	2,161,000		- -		- -	- -	
College of Natural							
Resources, Univ. of							
Wisconsin, Stephens							
Point	86,000		2,104,000		-2,104,000	- -	
WYOMING:							
Envir. Simulation							
Fac., Univ. of WY	431,000		1,065,000		-1,065,000	- -	
Reports on footnote							
(a) items	174,429		185,571		-185,571	- -	
Federal Admin. (3%)	(1,702,830)		(2,064,780)		(-2,064,780)	- -	
Total obligations ..	60,521,519	10	65,425,481	10	-65,425,481	- -	
Unobligated Balances:							
Available, start							
of year	(16,972,000)		(8,551,481)		8,551,481	- -	
Available, end							
of year	8,551,481		- -		- -	- -	
Total appropriation ...	52,101,000	10	56,874,000 (b)	10	-56,874,000 (1)	- -	

(a) Funds were provided to the Cooperative State Research Service for the purpose of reporting to Congress on the need for this facility. Actual funds are not earmarked for award to the institution.

(b) A rescission of \$34 million has been proposed for fiscal year 1994.

EXPLANATION OF PROGRAM

In the Fiscal Year 1994 Appropriations Act, \$56.8 million was appropriated to CSRS for Buildings and Facilities at designated institutions. These funds are available until expended and CSRS is awarding grants for these facilities to the institutions.

JUSTIFICATION OF DECREASE

- (1) A decrease of \$56,874,000 for Buildings and Facilities (\$56,874,000 available in 1994).

Need for Change. These funds were earmarked for facilities at specific institutions in 1994. Keeping with the Administration's policy of awarding research and construction grants through a competitive, peer-reviewed process, no additional Federal funding is being proposed in 1995.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Univ. of California, Davis/Riverside</u> <u>Altern. Pest Control Containment</u> <u>and Quarantine Facility</u>	1991 Report	(a)	Design work underway.
	1992 Planning and Construction	207,000 (b)	
	1993 Construction	178,000	
	1994 Construction	2,219,000	
	Total	2,604,000	
<u>University of California, Davis</u> <u>Grape Importation and Clean Stock</u> <u>Facility</u>	1990 Planning	128,000	Phase II construction complete. Construction underway for Phase III.
	1991 Planning and Construction	897,000	
	1992 Construction	1,609,000 (b)	
	1993 Construction	582,000	
	Total	3,216,000	
<u>Colorado State Univ., Fort Collins</u> <u>Animal Reproduction and Biotech.</u> <u>Facility</u>	1993 Report	(a)	Design work underway.
	1994 Planning	340,000	
<u>University of Connecticut, Storrs</u> <u>Agricultural Biotechnology Lab.</u>	1994 Report	(a)	Preliminary estimates received. Study to be conducted by CSRS in second quarter of FY 1994 to determine need for facility.
<u>University of Delaware, Newark</u> <u>Poultry Biocontainment Laboratory</u>	1993 Report	(a)	Pre-design work underway.
	1994 Planning	350,000	
<u>University of Florida, Alachua</u> <u>Agricultural Biotechnology Inst.</u>	1988 Feasibility Study	50,000	Design complete. Construction underway.
	1989 Planning and Construction	600,000	
	1990 Construction	1,530,000	
	1991 Construction	2,690,000	
	1992 Construction	840,000	
	1993 Construction	276,000 (c)	
	Total	5,986,000	

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Georgia Southern Univ., Statesboro</u> Center for Rural Health and Epidemiology	1993 Report	(a)	Study conducted by CSRS in FY 1993 and report submitted to Congress.
<u>Savannah State College, Savannah, GA</u> Center for Advanced Water Technology and Energy Systems	1991 Report 1992 Planning and Construction 1993 Construction 1994 Construction Total	(a) 136,000 376,000 213,000 725,000	Design complete. Construction will begin when all funds are in hand.
<u>University of Georgia, Athens</u> Biocontainment Facility	1988 Feasibility Study 1989 Construction 1990 Construction 1991 Construction 1992 Construction 1994 Construction Total	50,000 467,000 985,000 1,992,000 425,000 1,793,000 5,712,000	Design complete. Construction contract cannot be awarded until all funds are in hand.
<u>University of Georgia, Tifton</u> Environmentally Sound Production Agriculture Laboratory	1990 Report 1991 Planning and Construction 1992 Construction 1993 Construction Total	(a) 300,000 1,775,000 1,293,000 3,368,000	Design work nearing completion.
<u>University of Georgia, Tifton</u> Vidalia Onion Storage Research Facility	1991 Report 1992 Planning and Construction 1993 Construction Total	(a) 225,000 194,000 419,000	Design complete. In process of awarding construction contract.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>University of Hawaii, Manoa</u> <u>Ctr. for Tropical and Subtropical</u> <u>Agriculture</u>	1989 Feasibility Study	50,000	Design complete. Construction underway.
	1990 Planning	1,121,000	
	1991 Construction	5,675,000	
	1992 Construction	3,842,000	
	1993 Construction	3,311,000	
	Total	13,999,000	
<u>Oceanic Institute, Waimanalo, Hawaii</u> <u>Center for Applied Aquaculture</u>	1988 Planning and Construction	6,375,000	Phase I complete. Phase II planning underway.
	1994 Planning and Construction	2,219,000	
		8,594,000	
<u>University of Idaho, Moscow</u> <u>Agricultural Biotechnology Facility</u>	1990 Report	(a)	Design complete. Construction underway.
	1991 Planning and Construction	590,000	
	1992 Construction	500,000 (b)	
	1993 Construction	431,000 (c)	
	1994 Construction	888,000	
	Total	2,409,000	
<u>Northwestern Univ., Evanston, IL</u> <u>Biotechnology Center</u>	1991 Report	(a)	Phase II of construction scheduled for completion in FY 1994. Facility partially occupied.
	1992 Construction	600,000	
	1993 Construction	517,000	
	1994 Construction	888,000	
	Total	2,005,000	
<u>Indiana University, Bloomington</u> <u>Molecular and Cellular Biotech.</u> <u>Facility</u>	1990 Report	(a)	Construction underway.
	1991 Planning and Construction	1,500,000	
	1992 Construction	2,750,000	
	1993 Construction	2,155,000	
	1994 Construction	300,000	
	Total	6,705,000	
<u>World Ag. Dvlpmt. Fnd. (Des Moines)</u> <u>World Food and Agric. Capitol</u>	1993 Report	(a)	Study conducted by CSRS in FY 1993 and report submitted to Congress.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Kansas State University, Manhattan</u> Plant Science Research Center	1987 Feasibility Study 1989 Construction 1990 Construction 1991 Construction 1992 Construction 1993 Construction 1994 Construction Total	50,000 (d) 1,350,000 2,962,000 3,731,000 1,570,000 1,353,000 1,200,000 12,216,000	Construction nearing completion.
<u>University of Kentucky, Princeton</u> Applied Research and Manpower Training Center	1994 Report	(a)	Preliminary estimates received. Study to be conducted by CSRS in second quarter of FY 1994 to determine need for facility.
<u>Northw. St. Univ., Natchitoches, LA</u> Food Processing Facility	1993 Report	(a)	Study conducted by CSRS in FY 1993 and report submitted to Congress.
<u>Northw. St. Univ., Natchitoches, LA</u> Red Meat Processing Facility	1993 Report 1994 Planning and Construction	(a) 75,000	Pre-design work underway.
<u>University of Maine, Orono</u> Wood Processing Facilities	1993 Report	(a)	Study conducted by CSRS in FY 1993 and report submitted to Congress.
<u>University of Maine, Presque Isle</u> Building Consolidation	1990 Report 1991 Planning and Construction 1993 Construction Total	(a) 150,000 776,000 926,000	Design complete. Construction underway.
<u>Univ. of Maryland, College Park</u> Institute for Natural Products and Environmental Science	1991 Report 1992 Planning and Construction 1993 Construction 1994 Construction Total	(a) 1,000,000 862,000 1,776,000 3,638,000	Pre-design nearly complete. Organizing for architectural work.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Tufts University, Boston, MA</u> Center for Hunger, Poverty, Nutrition, and Policy	1991 Report 1992 Planning and Construction 1993 Construction 1994 Construction Total	(a) 562,000 (c) 484,000 (c) 2,343,000 3,389,000	Under municipal review. Zoning issue expected to be resolved by second quarter of FY 1994.
<u>Michigan State Univ., East Lansing</u> Food Toxicology Center	1989 Planning 1990 Planning and Construction 1991 Construction 1992 Construction 1993 Construction Total	1,250,000 2,962,000 5,076,000 10,394,000 (b) 4,616,000 24,298,000	Construction underway.
<u>University of Mississippi, Oxford</u> Center for Water and Wetlands Resources	1992 Planning and Construction 1993 Construction 1994 Construction Total	100,000 (b) 86,000 100,000 286,000	Pre-design work nearly complete.
<u>Missouri Botanical Garden, St. Louis</u> Center for Plant Biodiversity	1994 Report	(a)	Preliminary estimates received. Study to be conducted by CSRS in second quarter of FY 1994 to determine need for facility.
<u>University of Missouri, Columbia</u> Biosciences Research Center	1993 Report	(a)	Study conducted by CSRS in FY 1993 and report submitted to Congress.
<u>University of Missouri, Columbia</u> Meat Science and Safety Center	1993 Report 1994 Planning and Construction	(a) 2,428,000	Pre-design work underway.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Montana State University, Bozeman</u> <u>Bioscience Research Laboratory</u>	1989 Feasibility Study	50,000	Design work ongoing. Construction cannot begin until State matching funds are in hand.
	1990 Planning	247,000	
	1991 Construction	1,250,000	
	1992 Construction	1,062,000	
	1993 Construction	915,000	
	1994 Construction	1,987,000	
	Total	5,511,000	
<u>University of Nevada, Reno</u> <u>Whittell Biochemistry and Biology</u> <u>Field Research Station</u>	1992 Planning and Construction	250,000	Construction underway but delayed due to snow in Sierra Nevada Mountains.
	1993 Construction	215,000	
	1994 Construction	250,000	
	Total	715,000	
<u>Rutgers Univ., New Brunswick, NJ</u> <u>Center for Molecular Biology</u>	1988 Feasibility Study	50,000	Construction ongoing.
	1989 Planning	250,000	
	1990 Planning	89,000	
	1991 Construction	2,544,000	
	1992 Construction	3,044,000	
	1993 Construction	2,623,000	
	1994 Construction	2,329,000	
	Total	10,929,000	
<u>New Mexico State Univ., Las Cruces</u> <u>Center for Arid Land Studies</u>	1993 Report	(a)	Pre-design work underway.
	1994 Planning	849,000	
	Total		
<u>New York Botanical Garden, Bronx</u> <u>Library/Herbarium</u>	1991 Report	(a)	Design work nearing completion. Organizing for construction.
	1992 Planning and Construction	1,350,000	
	1993 Construction	3,697,000	
	1994 Construction	2,663,000	
	Total	7,710,000	
<u>Cornell University, Ithaca</u> <u>Research Greenhouse</u>	1992 Planning and Construction	375,000	Construction complete.
	1993 Construction	375,000 (c)	
	Total	750,000	

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Wake Forest Univ., Winston-Salem, NC</u> Center for Research on Human Nutrition and Chronic Disease Prevention	1990 Planning and Construction 1992 Construction 1993 Construction 1994 Construction Total	2,853,000 (e) 1,825,000 3,684,000 3,270,000 11,632,000	Construction is ongoing.
<u>Minot State University, Minot, ND</u> Inst. for Agricultural and Rural Human Resource Development	1992 Planning and Construction 1993 Construction Total	240,000 (b) 1,939,000 2,179,000	Construction is underway. Scheduled for completion in second quarter of FY 1995.
<u>North Dakota State Univ., Fargo</u> Animal Care Facility	1991 Report 1992 Planning and Construction 1994 Construction Total	(a) 250,000 1,775,000 2,025,000	Design complete. Organizing for construction.
<u>North Dakota State Univ., Fargo</u> Seed Research and Regulatory Fac.	1991 Report 1992 Planning and Construction 1993 Construction Total	(a) 500,000 431,000 931,000	Construction complete.
<u>North Dakota State Univ., Fargo</u> Food Processing Pilot Plant	1992 Planning and Construction 1993 Construction Total	375,000 (c) 375,000 (c) 750,000	Pre-design nearly complete.
<u>Univ. of North Dakota, Grand Forks</u> Inst. for Agricultural Health Science and Rural Medicine	1991 Planning and Construction 1992 Construction 1993 Construction 1994 Construction Total	2,892,000 4,381,000 1,864,000 650,000 9,787,000	Construction underway.
<u>University of Toledo, Toledo, OH</u> Lake Erie Soil and Water Rsch. and Education Center	1993 Report 1994 Planning	(a) 280,000	Pre-design work underway.

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>University of Toledo, Toledo, OH</u> <u>Plant Sciences Research Facility</u>	1992 Planning and Construction	275,000 (b)	Design complete. Construction underway.
	1993 Construction	237,000	
	Total	512,000	
<u>Oklahoma State Univ., Stillwater</u> <u>Beef Cattle Research Facility</u>	1993 Report	(a)	Pre-design nearly complete.
	1994 Planning	375,000	
<u>Oregon State University, Astoria</u> <u>Seafood Center</u>	1991 Report	(a)	Design work nearly complete.
	1992 Planning and Construction	217,000 (b)	
	1993 Construction	1,824,000	
	Total	2,041,000	
<u>Oregon State University, Portland</u> <u>Regional Food Innovation Center</u>	1992 Report	(a)	Design work underway.
	1994 Planning and Construction	2,663,000	
<u>St. Joseph's Univ., Phil., PA</u> <u>Center for Food Marketing</u>	1991 Planning	600,000	Project delayed due to facility siting issue.
	1992 Construction	2,710,000 (c)	
	1993 Construction	2,336,000 (c)	
	1994 Construction	2,074,000	
	Total	7,720,000	
<u>University of Rhode Island, Kingston</u> <u>Coastal Inst. on Narragansett Bay</u>	1990 Report	(a)	Design work complete. Organizing for construction.
	1991 Planning and Construction	1,904,000	
	1992 Construction	500,000	
	1993 Construction	431,000 (c)	
	1994 Construction	3,307,000	
	Total	6,142,000	
<u>South Dakota State Univ., Brookings</u> <u>Northern Plains Biostress Lab.</u>	1989 Feasibility Study/Planning	100,000	Construction complete. Facility dedicated in fourth quarter of FY 1993.
	1990 Construction	1,679,000	
	1991 Construction	1,970,000	
	1992 Construction	1,515,000	
	1993 Construction	875,000	
	Total	6,139,000	

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Middle Tenn. St. Univ., Murfreesboro</u> Hort. Public Service Research and Education Center	1993 Report	(a)	
	1994 Planning and Construction	287,000	Pre-design work underway.
<u>Tennessee State University, McMinnville</u> Nursery Crop Research Station	1990 Planning and Construction	247,000	
	1991 Construction	248,000	Design complete. Construction
	1992 Construction	426,000	underway.
	1993 Construction	367,000	
	1994 Construction	345,000	
	Total	<u>1,633,000</u>	
<u>University of Tennessee, Knoxville</u> Agricultural, Biological and Environmental Research Complex	1992 Planning and Construction	925,000	
	1993 Construction	797,000	Design work ongoing.
	1994 Construction	1,775,000	
	Total	<u>3,497,000</u>	
<u>Texas A&M University, College Station</u> Center for Southern Crop Improvement	1993 Report	(a)	
	1994 Planning	621,000	Phase I complete. Pre-design underway for Phase II.
<u>Texas A&M University, Houston</u> Inst. for Biosciences and Technology	1988 Feasibility Study	50,000	
	1989 Construction	1,250,000	Construction complete and facility operational in second quarter of FY
	1990 Construction	2,962,000	1992.
	1991 Construction	3,747,000 (f)	
	1992 Construction	3,860,000	
	1993 Construction	<u>603,000</u>	
	Total	<u>12,472,000</u>	

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>Utah State University, Logan</u> Biotechnology Laboratory	1990 Report	(a)	Phases I and II complete. Phase III nearing completion.
	1991 Planning and Construction	280,000	
	1992 Construction	764,000	
	1993 Construction	658,000	
	1994 Construction Total	<u>824,000</u> 2,526,000	
<u>Virginia Tech, Blacksburg</u> Agricultural Biotech. Center	1988 Feasibility Study	50,000	Facility undergoing partial redesign due to resiting. Redesign nearly complete.
	1989 Planning	100,000	
	1990 Planning	112,000	
	1991 Construction	918,000	
	1992 Construction	1,021,000	
	1993 Construction	880,000	
	1994 Construction Total	<u>1,469,000</u> 4,550,000	
<u>Washington State Univ., Pullman</u> Animal Disease Biotech. Fac.	1990 Report	(a)	Design work nearly complete. Groundbreaking scheduled for third quarter of FY 1994.
	1991 Planning and Construction	1,210,000	
	1992 Construction	2,120,000	
	1993 Construction	2,258,000	
	1994 Construction	<u>5,105,000</u>	
	Total	10,693,000	
<u>University of Wisconsin, Madison</u> Agricultural Biotechnology and Genetics Building	1989 Feasibility Study	50,000	Construction underway.
	1990 Planning	592,000	
	1991 Construction	2,600,000	
	1992 Construction	7,393,000	
	1993 Construction	<u>2,161,000</u>	
	Total	12,796,000	
<u>Univ. of Wisconsin-Stevens Point</u> Natural Resources Building	1992 Report	(a)	Design work ongoing.
	1993 Planning	86,000	
	1994 Planning and Construction	<u>2,104,000</u>	
	Total	2,190,000	

<u>Location and Facility</u>	<u>Year and Purpose</u>	<u>Funds Provided</u>	<u>Description</u>
<u>University of Wyoming, Laramie</u> Environmental Simulation Facility	1991 Report	(a)	Architect appointed in first quarter of FY 1994.
	1992 Planning and Construction	500,000	
	1993 Construction	431,000	
	1994 Construction	1,065,000	
	Total	1,996,000	
Reports (a)	1990	296,000	
	1991	300,000	
	1992	150,000	
	1993	260,000	
	1994	100,000	
	Total	1,106,000	

Footnotes:

- (a) Funds are provided to the Cooperative State Research Service for the purpose of reporting to Congress on the need for this facility. Actual funds are not earmarked for award to the institution.
- (b) Funds carried over to fiscal year 1993.
- (c) Funds carried over to fiscal year 1994.
- (d) Fiscal year 1987 funds carried over to fiscal year 1989 and awarded with construction funds appropriated in fiscal year 1989.
- (e) Funds carried over and awarded in fiscal year 1991.
- (f) Includes \$950,000 appropriated in fiscal year 1989 and earmarked for the University of Texas Southwestern in Dallas. Funds redirected to Texas A&M University in fiscal year 1991.

THURSDAY, MARCH 3, 1994.

EXTENSION SERVICE

WITNESSES

R. DEAN PLOWMAN, ACTING ASSISTANT SECRETARY, SCIENCE AND
EDUCATION
LEODREY WILLIAMS, ACTING ADMINISTRATOR
MITCHELL R. GEASLER, ASSOCIATE ADMINISTRATOR
RICHARD R. RANKIN, DEPUTY ADMINISTRATOR
STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

EXTENSION SERVICE

Mr. DURBIN. Our next panel, representing the Extension Service, includes Dean Plowman again, Dr. Leodrey Williams, the Acting Administrator, Mitchell Geasler, the Associate Administrator, Richard Rankin, the Deputy Administrator for Management, and Steve Dewhurst.

Dr. Williams, thank you for joining us.

Dr. WILLIAMS. Thank you.

Mr. DURBIN. We look forward to your testimony.

OPENING COMMENTS

Dr. WILLIAMS. Thank you, Mr. Chairman, and members of the committee. I appreciate the opportunity to appear before you to represent the Extension Service.

Extension, as you know, is a partnership between the federal partner at USDA, the land-grant universities, and the counties across this nation.

Dr. Myron Johnsrud, my predecessor has testified before you seven times. I've only been here seven months but I'm not new to Extension.

I started at the lowest possible level of Extension, and that was an assistant county agent doing youth work and horticultural work and everything else that came along with being an assistant county agent.

I have come up through the ranks of Extension and the various positions in middle management on up to the state office level, as an agricultural specialist. One thing that this has taught me is that every position and every member of this partnership is important.

When you are at the county level, you don't see the need for the middle managers. When you get to the middle managers level, you definitely don't need the state office people looking down on you, and when you get to the state office, you definitely don't need the Federal office there. [Laughter.]

But from the experiences that I've had with this—

Mr. DURBIN. When you reach the Federal level, you don't need Congress looking down on you. [Laughter.]

Dr. WILLIAMS. I won't comment on that.

Mr. DURBIN. I was waiting for that.

Dr. WILLIAMS. I won't comment on that one at all.

Mr. SKEEN. You've learned a lot about diplomacy, haven't you?

Dr. WILLIAMS. Yes, sir. [Laughter.]

In all of this, the members of the partnership are really important in making Extension work, and serving the people of this country that we are all concerned about.

Just a couple of items. I won't go through all of them because you do have the written testimony, but there are a couple of things in here that I'd like to mention.

This has been a very unusual year for Extension, and for the nation. We've had the E. Coli outbreak. We've had the fires of California. We've had the flooding of the Midwest, and the droughts of the southeastern area, but in each case, Extension was right there, on target, helping to meet the needs of people during these stressful situations.

Everything from providing information from around the country that they needed, from those who had experienced such disasters in the past, to actually filing out applications because at a time like this, everybody has to come to the rescue of everybody else.

We have been carrying out our mission of doing this, and being available to the people.

We have also had to redirect funds as necessary to help meet the needs in these crisis situations.

BUDGET REQUEST

Just a couple of things about the proposed budget. It's been decreased slightly by a little over \$2 million. It has not affected the amount of funds going to the land-grant universities, and we will still be able to operate.

We are grateful for the support that Congress has given to Extension, enabling it to meet the needs of its clientele.

A couple of the areas that we have proposed increases in this year deal with the food safety issue, which is uppermost on everybody's mind at this time, integrated pest management, pesticide applicator training, and sustainable agriculture.

All of these areas pertain to environmental impact, and that's where the increases have come. This budget will better able Extension to meet the needs of its clientele, and in carrying out its mission.

With that, I will end my comments here, and my able assistants here will provide any answers that you may need.

[CLERK'S NOTE.—A biographical sketch for Dr. Williams appears on page 740. The statement of Dr. Williams appears on pages 741 through 746. The explanatory notes appear on pages 747 through 776.]

MISSION OF EXTENSION

Mr. DURBIN. Dr. Williams, you've been, as you have just described, through all the levels of the extension program. The thing

that I've been noting as I have reviewed the Extension Service is how diverse the mission is.

Tell me in your own words, if someone came to you and said just what is the Extension Service and what do you do, how would you define your mission?

Dr. WILLIAMS. Our mission is education. That's number one. It's an opportunity to link the land-grant universities which was designed for this purpose, to meet the needs of the common person.

You know, during the early stages of this country, there was nothing being done to meet the needs of the common man, and the Extension programs of the land-grant universities were borne out of such a need.

That need is still there. We know that we don't have all of the farmers that we had during the early days of Extension, but we have a lot more people, and we have a lot more problems to address. The Extension Service is not just agriculture, but it links the resources of the land-grant universities to the clientele, whatever their needs are.

A good example of this is what we have in Louisiana. A leadership training program of officials who get elected to public office—maybe small-town mayors or county commissioners, or school board members. They have the wherewithal or the popularity to get elected, but they really don't know a whole lot about what the job is.

So we look on this as an opportunity to have the Extension agents call together several counties or parishes and put on a training program for people dealing with parliamentary procedure, how to conduct meetings, some of the dynamics of leadership, and some of the resources that are available to them in carrying out their job.

They want to do a good job. They just don't have the training, so we don't call on the agricultural people to do it. We go to the political science department, sociology department, and all of those who have the knowledge to do a better job with this training.

Extension is involved in getting the university to the people.

TECHNOLOGY AND INFORMATION TRANSFER

Mr. DURBIN. I know a lot of the efforts of the Extension Service is person-to-person, one-on-one.

Dr. WILLIAMS. Yes.

Mr. DURBIN. But there is also quite a bit of disseminating and sharing of information. As you look out over the horizon, you can see dramatic changes in the way we're going to share information in this country—new technology and new opportunities.

Is the Extension Service looking to that future, preparing for it, involved in it?

Dr. WILLIAMS. I think we're very heavily involved in it right now with our assistance education programs and with all of the satellite work that we do.

If you note, last year, we down-linked a Presidential address to some 247 sites around the Country. Some of our farmers come to what used to be subject matter training meetings in the various states and counties, and some of them will say—when will you people put this on satellite so I can get it in my livingroom?

Not everybody is like that, but there are many farmers and ranchers there who are prepared for this, and Extension is connected in most counties and state offices. There are things that can go from here directly to the states and the counties without having to go through everybody, so I think we're right on target with that now, sir.

EXTENSION IN RURAL DEVELOPMENT

Mr. DURBIN. Tell me a little bit about rural development. I think you alluded to the efforts that you're making to empower people, as well as developing rural America—small town America. We've got some serious problems out there—high poverty rates, unemployment still at unacceptable levels. What have you done in this area?

Dr. WILLIAMS. I think rural development is an ongoing part of the extension program. I have met with the Undersecretary for Rural Development, Secretary Nash, just to talk about the interconnectedness about what we do in Extension, and what his intentions are in rural development.

Personally I think that many of the problems that we have in our major cities, in our urban areas is simply because we have neglected to do the things in the rural areas that would keep people there that really needed to be there, who are unprepared to go into the innercities.

So when they did go, they became a part of the problem and not a part of the solution because of the whole lifestyle.

I think if we can do the economic development in the rural areas, and provide all of the necessities that are in the urban areas, many people would remain in the rural areas there.

Mr. DURBIN. I think your observation is right, but do you have any examples you can share with us of projects that Extension is working on or has done in the past that have been successful in rural development to avoid some of the problems you've described?

Dr. WILLIAMS. Yes, sir. I think if you go back to the various states, you can look at the small manufacturing that can turn something around, in a rural area. It doesn't have to be some major manufacturing. It may be a garment factory where we have been involved in their relocation to small towns or to rural America.

This could be duplicated throughout every state, and we do have these kinds of programs that go on all the time.

NUTRITION AND HEALTH PROGRAMS

Mr. DURBIN. Let me switch to another area that I think is related. We have a very serious problem in this country with teen pregnancies. We also have very serious problems in terms of children who are born at risk both physically and emotionally.

Now, the Extension Service is involved, to some extent, in bringing the WIC program into homes. Can you describe for me what work you are doing in this area?

Dr. WILLIAMS. We would like to—let Dr. Geasler take that.

Mr. DURBIN. Okay.

Dr. GEASLER. Let me respond by a couple of examples. What you are citing in terms of teen pregnancies, those kinds of issues, are really symptoms of other problems.

We have a number of examples in states that are dealing very specifically with the issue behind the symptom. We've got a major initiative in what is termed Plight of Young Children where we are developing curriculum to deal with prenatal issues all the way through the five year old child.

We are right now in the process of trying to define measurements, outcomes, if you will, that are part of the Government Performance Results Act, and looking at how we can actually detail some outcomes of that program, targeting, and changing some very basic things.

The frequency of low birthweight babies, for example, is one of the areas that we hope to target as an outcome of a curriculum that is working with pregnant women.

We have a major program in Alabama that is dealing with those clientele, and is coordinated with WIC and other federal programs. We're in the process of trying to duplicate that program in other states.

So there are different types of efforts underway that deal with these kinds of issues. Our youth at risk effort is clearly a part of that.

Mr. DURBIN. We are trying to reach full funding of the WIC program, and I think we will in several years, although the term itself, full-funding, is subject to definition. We will never reach every eligible person. Some eligibles will be so expensive to bring into WIC that it would not be cost-efficient. Yet what the Extension Service does, as I understand it, in making home visits to talk about nutrition education, may be the only way to reach some people who do need help desperately. Can you tell me what is being done in this area?

Dr. GEASLER. We feel very strongly about the need for what we term nutrition education which is a different definition than delivering information relative to nutrition.

Many programs disseminate information. We hope to develop and achieve a curriculum and deliver it so that eating habits and diets of people are actually changed.

That takes a much more concentrated effort, in some cases, one-on-one, but not always one-on-one. Our expanded food and nutrition education program is heavily one-on-one. It is conducted by technicians, individuals that are trained in that community to work with individuals, peers, if you will, in that community.

We also are very active with WIC and the food stamp program, but primarily WIC, in identifying the very difficult cases, bringing those together in an educational program and an educational setting.

We're early in the process of that effort. Our EFNEP program has very sound data that says that we do change eating habits dramatically, and that's our objective.

Mr. DURBIN. Some critics have said that the Federal government lacks a coordinated definition of our nutritional goals. Through this subcommittee, there are many different nutrition and feeding programs affecting virtually every American at every stage in life. I have been curious as I have gone through it as to whether or not we really have enumerated our goals. I wonder if we have given a clear nutrition agenda and message to agencies like yours; so

that you will know when you speak to someone whether it is a food stamp recipient, a child in the school lunch program, someone in EFNEP or WIC, that a consistent message is delivered.

Do you sense that this type of coordinated effort is in place, or does it need to be worked on?

Dr. GEASLER. There is a system in place, but that's not to say it doesn't need to be worked on. We are constantly interacting with other agencies both in the Department and external to the Department that deal with nutrition and nutrition education.

I think we've made great strides in the past few years with the development of the food pyramid and the understanding and the research base behind the food pyramid in delivering a consistent message.

I'm always pleased when I see that information used by the private sector. I think that's helping get that total message out.

We need to continually strive to do a better job of coordinating that effort internally. We also need to bring the research scientists from our Federal labs and our university research in conjunction with our nutritionists that are part of our Extension system and the university into that mix.

The research base changes, and as that changes the people that need to feed those changes up through the system. We can be a link to take that research and deliver it to the agencies across government, but it's a continuing process. We need to continue to work on it.

Mr. DURBIN. Dr. Williams, let me get a little more specific. Nutrition education activities have been provided through the Expanded Food and Nutrition Education Program, EFNEP, for over twenty years. In addition to EFNEP, a new program, the Nutrition Education Initiative, has been funded the past two years to provide nutrition education specifically to WIC recipients. It has been stated in the past that approximately 45 percent of the EFNEP participants are also WIC participants. Both programs are operated by State and local agencies. How are they coordinated to assure there is not a duplication of effort?

Dr. WILLIAMS. We have a commitment to increase nutrition education programming for WIC participants, whether through EFNEP or the new Nutrition Education Initiative—NEI. The plans of work and/or proposals for both EFNEP and NEI were submitted through the State Directors of CES, providing oversight of the programs at the State level. These plans were reviewed and approved at the Federal office, with the same individual responsible for both programs. The NEI program is designed to complement and not duplicate the efforts of EFNEP. We will be reaching more WIC participants than were reached before the NEI was funded.

Mr. DURBIN. What oversight is provided at the Federal level to assure these programs are effective in meeting Federal policies and guidelines on nutrition? Do you believe this oversight is adequate?

Dr. WILLIAMS. For EFNEP, each State and Territory submitted a 4-year plan of work covering the years 1992–1995. These plans were reviewed and approved, with modifications if necessary to meet program expectations. Each year States submit updates to the plan of work, identifying any changes that are anticipated, and submit an annual accomplishment report. These updates and ac-

accomplishment reports are reviewed by the Federal office and feedback is provided to the States on the strengths and weaknesses of the program.

For the NEI, plans of work were reviewed and discussed with a team comprised of both ES and FNS employees. States submitted an accomplishment report in December 1993 and will submit updates to the plans of work when necessary. Annual accomplishment reports are required, and States will be sharing examples of the nutrition education materials being used with the clients.

Additionally, some States also received special projects. These states will be submitting interim accomplishment reports and proposals for full implementation to receive continuation or expansion funding.

The Economic Research Service is assisting with the evaluation component of this initiative. Common impact indicators have been developed for all NEI projects, and States are being assisted in identifying common evaluation methodology. We believe that these oversight measures are adequate.

Mr. DURBIN. I know it varies from State to State, but can you tell us what percent of nutrition education and counseling is provided one-on-one, in the home, for both programs?

Dr. WILLIAMS. In FY 1993, 34 percent of EFNEP participants received nutrition education through individual contacts. Fifty-five percent of the participants were reached through group teaching and 11 percent participated in a combination of individual and group instructional methods.

We do not yet have data from the initial implementation of the NEI, so we are unable to provide estimates of the numbers reached one-on-one or in groups.

Mr. DURBIN. Has the Department conducted any studies to determine what is the most effective and cost-beneficial way of delivering nutrition education and counseling to the low-income population, whether that is through group sessions, home visits, or as a step in the application process to receive benefits?

Dr. WILLIAMS. There was a study conducted in the late 1980s that looked at effectiveness of various delivery methods. The study found that, where feasible, group lessons increase case-load of paraprofessionals while maintaining the quality of the program. In the more rural parts of the country, it is often not feasible to conduct group classes. The families may live in widely scattered areas and transportation is limited. In addition, some families may be experiencing multiple problems and need special attention.

In many areas, we do coordinate with the Federal Food Assistance Program offices, such as Food Stamps and WIC. In a limited number of cases, we are able to conduct classes on site at the food program office. In other locations, we have cross-referral systems in place.

The success of EFNEP is built on the concept that you must engage the participant in the learning process, and through experiential learning, give them the skills necessary to make appropriate behavior changes. Since it is difficult to change eating habits, the educational program needs to be sufficiently sustained that the participant can make small changes, experience success and be willing to make additional changes. Thus a series of lessons is con-

sidered necessary to achieve behavior change, rather than a one time contact.

Mr. DURBIN. As we move towards full-funding of the WIC program, what does this mean for the Nutrition Education Initiative? What is the goal for this program?

Dr. WILLIAMS. States received their first year funding for the NEI last summer, and it is still too early to determine the full impact that the program will have. Three objectives for the program were identified: extension programs will increase interagency cooperation related to nutrition education in order to reach an increased number of the "neediest" WIC population; participating individuals will acquire the knowledge and skills that contribute to nutritionally sound diets and a healthy lifestyle; and participating individuals will acquire behaviors that contribute to nutritionally sound diets and a healthy lifestyle. Specific indicators were identified for measuring the impact of each objective.

While we do not yet have much data on the impact of the NEI, we do know there have been positive outcomes. This initiative is bringing about closer collaboration between the state and local CES offices and the WIC program sites. We expect that participants are gaining knowledge related to appropriate diets during pregnancy, lactation and early childhood; are learning skills related to food purchasing, preparation, storage and safety; and are adopting improved behaviors related to breastfeeding initiation and duration and making appropriate food choices.

As the NEI projects continue, we may find that the current working definition of the "neediest" WIC participants is a valid one, and that when these individuals receive intensive nutrition education, they are able to make the necessary changes to improve birth outcome by reducing the number of low birth-weight babies, are able to reduce childhood illness through improved feeding practices of infants, and are able to make more economical food choices. If these benefits are realized, then continued or expanded funding for NEI may be highly desirable. If funding remains available for this initiative, these successes may be realized by future WIC participants.

Mr. DURBIN. How many WIC recipients were served in fiscal year 1993, and how many do you expect to serve in fiscal year 1994?

Dr. WILLIAMS. The ES/WIC Initiative reaches it's WIC recipients through two different programs. Because most programs were not implemented until funding was available to them, most annual reports reflected status of program implementation. Until the programs have been fully implemented, we are only able to provide the number of WIC recipients that were expected to be reached.

WIC recipients expected to be reached in FY 1994 through the formula-funded programs total approximately 10,000 assuming a full year of implementation. WIC recipients expected to be reached for FY 1993 through special projects total approximately 5,000, with this number increasing when full implementation is reached.

In addition, EFNEP reached nearly 100,000 WIC participants in FY 1993, which is approximately 49 percent of the adult EFNEP participants. We would expect the WIC participation in EFNEP to be over 100,000 in FY 1994.

Mr. DURBIN. Nutrition Education Initiative funding is distributed to States two ways. First, each State receives \$30,000 based on an approved plan. The remaining amount is used to support project proposals that are developed to reach specific audiences. Provide a list of all projects that received funding during fiscal year 1993, including a brief description, the amount of funding received, the length of the proposal, and the goals to be achieved.

Dr. WILLIAMS. The goal of the Extension/WIC Nutrition Education Initiative is to change the behavior and promote the nutritional well being of the "neediest" of participants in the Special Supplemental Food Program for Women, Infants and Children (WIC). The length of the proposals are for one year with an option to extend to a second or third year. A brief description of each of the competitive projects and the amount of Federal funding received will be provided.

[The information follows:]

State	Title	Brief Description	F u n d s	
			Received	
CA	Culturally Relevant Nutrition Education for Vietnamese WIC-eligible Women	Will provide nutrition education to Vietnamese, non-English speaking participants in urban communities, using culturally-adapted curriculum	\$99,800.00	
CO	Using Distance Learning and Abuelas To Teach Low-Income Hispanics and Migrants	Will provide nutrition education to Hispanic (including migrants) WIC-eligible participants in rural areas, using distance learning to train the trainers	\$97,765.00	
FL	Addressing the Nutrition and Health Needs of Haitian Women Who Are Pregnant, Breastfeeding and/or the Mothers of Children Under Five	Will provide nutrition education to Haitian WIC-eligible participants using new curricula to improve diets	\$89,892.00	
GA	TAMS Integrated Nutrition and Health Program	Will provide nutrition education to WIC-eligible prenatal teens, focusing on prenatal diets and infant feeding practices	\$57,380.00	
GU	Early Experiences and Counseling for Effective Lactation (EXCEL)	Will provide nutrition education to Pacific Islander teens who are WIC-eligible, including intergenerational teaching	\$73,460.00	
IA	Building A Peer Network of Nutrition and Breast-feeding Support for Rural Iowans	Will provide nutrition education to WIC-eligible mothers of infants in rural communities	\$61,923.00	
MD	Infant Nutrition for Hispanic WIC Population: A Peer Education Model	Will provide nutrition education to WIC-eligible Hispanic new mothers	\$89,004.00	
MI	Michigan Extension/WIC Breastfeeding Support Nutrition Education Initiative	Will promote breastfeeding in prenatal, WIC-eligible mothers	\$74,588.00	
MN	Nutrition: Making Life Healthy	Will provide nutrition education to WIC participants in the counties of Becker, Clearwater and Mahnommen including the White Indian Reservation	\$37,000.00	
NV	Meeting The Nutrition Education Needs of Hispanics in Nevada	Will provide nutrition education to WIC-eligible Hispanics	\$100,000.00	
NY	Building Blocks For Toddlers	Will provide nutrition education to WIC-eligible mothers of toddlers in rural and urban areas	\$94,500.00	

NC	North Carolina Special Programs Expansion Project	Will provide nutrition education to all teens and prenatal mothers who are WIC-eligible and support breast-feeding efforts	\$98,357.00
OK	OK/CES WIC Nutrition Education Initiative	Will provide nutrition education to Native American pregnant teens who are WIC participants	\$100,000.00
RI	WIC/EFNEP Southeast Asian Nutrition Education Initiative	Will promote initiation and duration of breastfeeding and nutrition education of Southeast Asian WIC mothers	\$61,962.00
SC	Nutrition Education for Women	Will provide nutrition education to pregnant/parenting and breastfeeding adolescent and adults in four counties	\$100,000.00
TX	Madres Mejores Y Ninos	Will provide nutrition education to the neediest WIC participants using compact disc-TV modules and group sessions	\$98,000.00
WA	Parents and Children Growing Together	Will provide nutrition education to young Hispanic mothers with preschoolers. Will include critical thinking and problem solving methods	\$98,842.00

Mr. DURBIN. The States are required to provide matching funds equal to at least one-half the amount received from Federal funds. How much did the States provide in fiscal year 1993?

Dr. WILLIAMS. In FY 1993, over \$1.6 million was provided by the States in matching funds for both the special projects and the formula-funded projects.

EFNEP

Mr. DURBIN. Is the same requirement for matching funds established for the EFNEP program?

Dr. WILLIAMS. The States are not required to provide matching funds for EFNEP. State and local governments do provide additional dollars and in-kind services to support the program. Many States are cooperating with other organizations and receiving non-Extension funding through grants to help finance and enhance their programs.

Mr. DURBIN. Under EFNEP, what percent of the total funds were devoted to families on food stamps, the WIC program, or other Federal food assistance programs in fiscal year 1993?

Dr. WILLIAMS. In FY 93, approximately 65 percent of the EFNEP families were also Food Stamp participants, 49 percent were WIC participants and 61 percent participated in other Federal food assistance programs. There was no specific designation within the EFNEP allocation to reach these audiences, although we have made increased efforts to work collaboratively with these programs.

Mr. DURBIN. Last year, you provided the Committee with a table showing the number of participants that received assistance under EFNEP from 1987 to 1993. Would you update this table for us to reflect 1993 actuals and 1994 estimates?

Dr. WILLIAMS. The information will be provided for the record.
[The information follows:]

Year and Number of Participants: 1987—517,163; 1988—556,918; 1989—615,639; 1990—641,480; 1991—677,878; 1992—667,187; 1993—660,677; and 1994—665,000 estimate.

EXTENSION RESOURCE NEEDS

Mr. DURBIN. Dr. Williams, what area of activity at the Extension Service do you feel is especially effective, and yet is not getting the kind of resources and attention that it should from either Congress or the USDA?

Dr. WILLIAMS. Some of the areas that are proposed for funding increases, could be increased at a greater rate—the integrated pest management, the pesticide training programs. These are things that impact the environment and farmers.

A couple of months ago, I was real pleased to receive from then Virginia Governor Wilder, the Environmental Excellence Award as the Federal partner for some work that was done in Virginia from an Extension grant where we were working with urban lawn families, and programs that dealt with pollution of the Chesapeake Bay.

But I think some of the areas that we're dealing with, as well as the areas that have been mentioned concerning the child and limited resource families, these areas need to be enhanced.

CONTRACT EMPLOYEES

Mr. DURBIN. You've probably heard me ask other agencies about contract employees.

Dr. WILLIAMS. Yes, sir.

Mr. DURBIN. Can you tell me what the level of FTEs is in your agency, what is proposed as part of your agency reductions, what is your level of contract employees, and any proposed reductions in that area?

Dr. WILLIAMS. We have two contract employees in the Agency who render primarily computer services and we have 18 shared positions. We could do away with these contract employees almost instantly and the shared positions within 30 days.

Mr. DURBIN. And what is your current level of FTEs?

Dr. WILLIAMS. Current level of FTE's, we have 180. Attrition will take this down to around 170.

Mr. DURBIN. Is that over a four year period?

Mr. RANKIN. During fiscal year 1995, we are scheduled to go from 180 to 170 FTEs, and then from 1995 to 1998, an additional cut of seven positions.

Mr. DURBIN. Is it your goal that this reduction will be achieved through attrition?

Dr. WILLIAMS. Yes, through attrition, the buy-outs, and the early-out retirement, but basically through attrition.

REDUCING EMPLOYMENT

Mr. DURBIN. You also propose to achieve reductions by streamlining your operations. Specifically, how do you propose to do this?

Dr. WILLIAMS. Hopefully, the streamlining of operations will result from the reorganization efforts and attrition enhanced by early retirements and voluntary separation incentive payments. Additional options would be the realignment of internal agency responsibilities between program units, consolidation of program areas that have related program goals and focuses, and the reassignment of national program leadership to maintain the Federal partners role in the national initiative programs of the Extension system.

REGIONAL-BASED EXTENSION AGENTS

Mr. DURBIN. Included in the fiscal year 1994 appropriations bill was report language expecting the Secretary to study the feasibility of using regional-based extension agents rather than an agent in every county and to report the findings and recommendations to the Congress no later than January 1, 1994. When can we expect to see this report.

Dr. WILLIAMS. The Secretary has proposed a major reorganization of the Department. A review and study by the Secretary of the field structures of USDA agencies and those in support of the Department's programs, such as the State Extension Services and their local organizations, is to be forthcoming sometime later this year from that Office.

REORGANIZATION OF USDA

Mr. DURBIN. The Secretary has already submitted his reorganization proposal to Congress. What is the Secretary's proposal for the Extension Service?

Dr. WILLIAMS. The Secretary's proposal places the Extension functions under the Assistant Secretary for Research, Education and Economics. Existing agency structures would be streamlined by combining the programs of the Agricultural Research Service, the Cooperative State Research Service, the Extension Service and the National Agricultural Library into the Agricultural Research and Education Service. The mission of the new agency would be to continue to address the agricultural, food and natural resource needs of the American public through the conduct and delivery of integrated research, education and related services.

Mr. DURBIN. What recommendations have you made to the Secretary regarding the restructuring of Extension?

Dr. WILLIAMS. Of course the Extension Service is supportive of the Secretary's reorganization plan in order to achieve a more efficient and effective Department that is focused on servicing the people of this nation. Our recommendations to the Department during the reorganization planning were to continue the partnership relationship that Extension Service has with the Land-Grant Universities and the local extension entities. That partnership, which has endured for 80 years is absolutely essential to the transfer of research and technology results from the programs which are conducted by the Department of Agriculture. Additionally, we emphasized the primary mission of Extension, which is, education. Extension education programs need to continue assisting individuals and communities in identifying and solving farm, home, and local programs through the application of information developed by USDA and the Land-Grant universities.

STATE/COUNTY PERSONNEL

Mr. DURBIN. How many Extension agents do you currently have at the State and county levels?

Dr. WILLIAMS. There are approximately 9,574 state and county Extension Agents. They are part of a total of 16,676 state and county Extension employees.

Mr. DURBIN. These agents are not Federal employees, but Federal funding is used to pay part of their salaries and expenses. For the record, please describe in detail the funding mechanism of the Cooperative Extension System.

Dr. WILLIAMS. Federal contributions are primarily derived from the Section 3b&c formula provisions of the Smith-Lever Act of 1914, comprising some 63 percent of the total FY 1994 Federal funding. These funds are allocated to the States and the territories on the basis of the rural and farm population of each. The core of the State Extension Service programs is financed from these sources because of its discretionary nature. States can utilize funds for locally determined programs, as well as for high priority regional and national concerns. Currently, Federal Extension funds comprise approximately 30 percent of the total resources for Extension programs nationwide. Our State partners provided 48 percent,

countries 18 percent, and 4 percent from the private sector. Other sources of Federal funding include the Smith-Lever 3D or earmarked funds which comprise approximately 25 percent of the total FY 1994 Federal contribution. These earmarked or targeted funds are allocated to the States to address special programs or concerns of regional and national importance and are primarily distributed according to the extent of the problem that requires attention in each State.

Mr. DURBIN. What role does the Federal government have in the hiring and firing of these employees as well as establishing their salary level?

Dr. WILLIAMS. The State Extension Director is the only position where the Federal government has any role. A nominee for the State Extension Director or Administrator must be approved by the Secretary of Agriculture. Salary levels are established within the States.

Mr. DURBIN. In last year's hearing record you provided a table showing the total Extension funding by States for fiscal year 1992. Would you please provide this same information for fiscal year 1993?

Dr. WILLIAMS. I would be happy to provide this information for the record.

[The information follows:]

[illegible]

The following \$689.0 million is available for Special Projects: \$645,000 for Integrated Pest Management Projects; \$1,077,000 for Pesticide Impact Assessment Projects; \$1,760,000 for AgrAbility Project; \$1,300,000 for Food Safety and Quality Projects; \$1,100,000 for Indian Reservation Projects; \$100,000 for Youth At Risk Projects; \$3,200,000 for Water Quality Projects; \$1,680,000 for Multistate Unmanned Aerial Systems Projects; \$2,000,000 for Agricultural Telecommunications Projects; \$2,000,000 for a Rural Health and Injury Clinic; \$1,000,000 for Rural Technology Grants; \$1,000,000 for Socially Disadvantaged Farmers and Ranchers; \$4,000,000 for Federal Employees Retirement System (ERS); and \$4,250,000 for a Rural Health and Injury Clinic.

†) District of Columbia Public Postsecondary Education Reorganization Act.

PESTICIDE APPLICATOR TRAINING

Mr. DURBIN. Your budget request includes an increase of \$2.0 million to implement a pesticide applicator training program. These funds will be used to develop educational materials from a regional and national perspective. Would you be more specific as to how this program will operate?

Dr. WILLIAMS. These funds will be used for the basic pesticide applicator and pesticide education program, an extension educational effort that reaches over 400,000 individuals each year. Part of the basic program is dedicated to instruction in Integrated Pest Management.

As new programs such as the worker protection standard, endangered species and ground water protection are initiated to meet the increasing demand for training, it is necessary to develop educational material to assist pesticide users, farmers, ranchers, agricultural employers and the general public in the education and implementation of these programs.

Most of the materials developed can and should be done on a regional and national basis, to save on costs and avoid duplicity. States no longer have the luxury of developing their own materials; a regional or national base of educational materials will allow them to adhere to national guidelines and at the same time develop state specific materials according to local need, to share in electronic networking and greatly reduce costs.

Mr. DURBIN. New EPA regulations covering farm worker safety will go into effect in April. Will this program be developed to meet the requirements of these new regulations?

Dr. WILLIAMS. An educational program on farm worker safety is being conducted by most of the state cooperative extension services. Since there have not been federal funds appropriated for this activity, most of the costs have been absorbed out of state budgets. Funds being requested would be used for timely educational programs such as worker protection, along with the developing of quality educational materials.

Mr. DURBIN. How many extension pesticide coordinators are there nationwide?

Dr. WILLIAMS. Each state has at least one pesticide coordinator, as well as one in each territory, the District of Columbia, and the Commonwealth of Puerto Rico.

INTEGRATED PEST MANAGEMENT

Mr. DURBIN. You are also requesting an increase of \$2.0 million for the Integrated Pest Management program or IPM. How will these two programs be coordinated?

Dr. WILLIAMS. The Pesticide Applicator Training, PAT, program teaches safe and efficient use of pesticides and, therefore, includes elements of integrated pest management, IPM. However, PAT emphasizes pesticide application management while IPM emphasizes management of the pests. We try to link both PAT and IPM so that they are complementary and not duplicative. However, each contains parts of the other so that individuals who participate in only one can be aware of the other program and aware of the availability of further training.

Mr. DURBIN. Part of the IPM increase will be used to develop a core national training program. How will this training program be different from the pesticide applicator training program?

Dr. WILLIAMS. Part of the IPM increase will be used to create a core national program to train agricultural production consultants and others in the use of biologically intensive pest management strategies. The pesticide applicator training program is geared to the safe use of pesticides. IPM is a complex array of techniques and strategies used in agriculture to manage pests in an economically viable and environmentally benign manner.

Mr. DURBIN. You have reported that for fiscal year 1992 the ratio of Federal funds appropriated for IPM programs to grower payments for IPM services was approximately 1 to 4. In addition to this, State appropriations for IPM programs were \$9.3 million, or about 13 percent more than the Federal appropriation. What are these figures for fiscal year 1993? Do you expect this to change in fiscal year 1994?

Dr. WILLIAMS. The ratio of federal funds and grower payments for IPM services in fiscal year 1993 remained about the same as in 1992, approximately 1 to 4. State appropriations also remain about the same even though individual States have changed somewhat due to budgetary concerns. The projected increase in 1995, together with increased emphasis on reduced pesticide use may cause grower payments for IPM services to increase over time. Total State funding may also increase over time. Ratio comparisons may also increase over time as more producers become IPM users and as industry becomes more capable of delivering services to them.

Mr. DURBIN. What pesticide impact assessments were completed in fiscal year 1993 and what assessments are currently under way?

Dr. WILLIAMS. The assessments that have been completed in FY 1993 are: the Biologic and Economic Assessment of Methyl Bromide, April 1993, and the Importance of Pesticides and Other Pest Management Practices in US Cotton Production, June 1993.

The assessments of pesticide active ingredients that are currently under way are for chlorpyrifos, diazinon, propargite, and 2,4-D. The assessments of pesticides used on specific commodities or unique sites that are presently under way include peanut, sorghum, corn & soybean, rice, cranberry, alfalfa, citrus, nursery & greenhouse, fungicides on leafy green vegetables, and the cluster of pesticides used at planting time on corn.

NATIONAL INITIATIVES

Mr. DURBIN. Last year, Dr. Johnsrud listed eight national initiatives of the Extension Service and provided a brief description of each. Are there any changes to this list?

Dr. WILLIAMS. No. There are still the same eight national initiatives.

FARM SAFETY

Mr. DURBIN. In fiscal year 1993, \$970,000 of the farm safety appropriation was used to partially fund a farm safety specialist in each of the 50 States and Puerto Rico. Their job is to educate farmers and their families on how to prevent farm accidents and reduce

their exposure to occupational health hazards. What is the amount currently being used in fiscal year 1994 for these specialists?

Dr. WILLIAMS. The total \$988,000 appropriation will be used to support farm safety specialists.

Mr. DURBIN. You are proposing to shift the focus of the farm safety program in fiscal year 1995 to providing funds for project proposals in targeted farm safety programs. Does this mean you no longer plan to support these specialists?

Dr. WILLIAMS. No. Project proposals will be requested from these specialists and awarded on a merit basis focusing on: farm safety and health programs that will effectively reduce the traumatic injury and death rates of farmers and farm families; reduce exposure to agricultural chemicals, noise, dust, infectious agents, vibrations, etc. that have been shown to result in occupationally induced acute and chronic illness and injury; train emergency rescue professionals and farm families on farm accident victim extrication and emergency response procedures; develop scientific evaluations to improve the effectiveness of farm safety education programs.

Mr. DURBIN. Funding for AgrAbility projects is being proposed for deletion. Tell us what these projects have accomplished and how their goals and objectives will be continued under your new farm safety program.

Dr. WILLIAMS. Over three years, AgrAbility has provided direct education and assistance to nearly 2,000 farmers, ranchers, agricultural workers and their families with disabilities. More than 2.8 million people learned of the project at a thousand agricultural or health-related events. Over 2,000 agriculture, vocational, and health professionals have participated in specialized educational programs to enhance their professional competencies in providing services to farmers with disabilities. These projects will continue to pursue their goals and objectives through non-targeted federal funds, State and local funding, and private contributions.

Mr. DURBIN. Please update the table that appears on page 281 of last year's hearing record, showing the budget request for the farm safety program and the amount appropriated, to include fiscal year 1994.

Dr. WILLIAMS. I will be happy to provide this information for the record.

[The information follows:]

FARM SAFETY
[In thousands of dollars]

	President's budget	Actual appropriation
1983	0	\$1,020
1984	0	1,020
1985	0	1,020
1986	0	970
1987	0	970
1988	0	970
1989	0	970
1990	0	963
1991	0	1,970
1992	0	1,470
1993	\$1,000	2,720
1994	988	2,988

FOOD SAFETY

Mr. DURBIN. In the past, a portion of the appropriation for food safety was made available to States on a project proposal basis. Was this the case with fiscal year 1994 funds? If so, how much was made available for this purpose and what projects have been funded?

Dr. WILLIAMS. Most of the fiscal year 1994 food safety funds were still made available on a project proposal basis to the States. Each eligible institution is able to request up to \$20,000 through a project proposal that addresses one or more of a number of priority educational program objectives for clientele. These include: adoption of recommended food handling practices that minimize the risks of foodborne illness occurring; increased understanding of food-related risks and the policy and scientific bases for risk management decisions; and reduction of foodborne hazards in a food production or processing environment. Another \$497,000 is available on a competitive project proposal basis for four specific types of programs: coordination and technical support of Extension food handler education programs; harmonization of food handling recommendations for disaster and emergency situations; programs that enhance the educational delivery, implementation and evaluation of Hazard Analysis Critical Control Points (HACCP) and Total Quality Management (TQM) principles to control microbial hazards in food animal or aquatic production and processing; and programs to increase understanding of food safety related issues in biotechnology or food irradiation. Project proposals will be reviewed and awarded within the next few months.

Mr. DURBIN. In your statement, you state that continued support will be given to the interagency cooperation on applied research and education pilot programs across the food chain. Would you please describe this effort in further detail?

Dr. WILLIAMS. Since its inception, the educational goal for clientele in the Extension Food Safety Initiative has been to improve the ability of all members of the food system—producers, processors, distributors, retailers, food service personnel, consumers and others—to make informed, responsible decisions related to food safety issues. The operational goals for the way the System would plan and conduct its programming have included promoting programs that build on, utilize, integrate and/or promote cooperation among government agencies, the private sector, professional organizations and related CES programs. The stated operational goals have been considered in selection of projects for funding. Requests for proposals for this food safety program continue to emphasize the priority that will be placed on programs that provide interagency cooperation.

The CES has also been cooperating with the FSIS, APHIS and others on various aspects of the Department's Pathogen Reduction Plan, most specifically in exploring models and potential demonstration projects for preharvest pathogen reduction and food service education and public information and education programs on safe food handling. Because these efforts have been part of the objectives for the CES Food Safety Initiative since FY 1991, the support will be provided through opportunities for special project

funds in the Agency's budget. The increase requested would allow more funds to be available for programs in these priority areas.

Mr. DURBIN. The Washington Cooperative Extension Service is establishing a Statewide information communication system as a vehicle for interagency coordination for food handler education, consumer education, and food safety emergency responses. What is the status of this system and can it be used as a model for other States to access?

Dr. WILLIAMS. The Washington State FOODLINK project will be performing three major functions. One is to link the Washington food safety educators and regulators through Internet electronic mail. Another is to provide an electronic forum, mail group reflectors, for the public to ask questions and receive answers about food safety and for communication between educators and public agencies in the state. The third function is to provide electronic access to national reference databases such as Medline ERIC for the multiagency participants in FOODLINK. The project directors at Washington State University have purchased the needed equipment and accomplished the FOODLINK listserve mailer and WSU gopher electronic connections. The county Extension offices involved in the pilot are "on line" and the staff have been trained. Appropriate contacts have been made with the health districts and State Departments of Agriculture. Training for health staff is being scheduled. The health sites involved will receive their modems for electronic connections in connection with the training.

The system will definitely be analyzed as a potential model for other states and its effect on interagency communications. The project evaluation will assess the quantity of computer-mediated interaction among participants. A sampling of participants will be surveyed about the quality of the communications. A most important factor that will affect the participation of other states, or even expansion throughout Washington, is the availability of the necessary equipment and technology support systems. Another problem encountered so far is that the data processing personnel in local government offices are not used to operating on the Internet and the Washington State University Extension (WSU) staff is having to first educate the county government cooperators on the Internet before they will agree to the connections. As a mail reflector system and communications linkage that is gopher-resident, there will be no need to duplicate the entire system for other states. Internet connections will allow national or international access to the linkages provided through the WSU gopher. Any documents loaded onto the system will be maintained and available online. Until other Washington agencies can provide their own Internet access, other agencies will be asked to pay for their computer usage if they continue to access Internet through the WSU domain.

Mr. DURBIN. When can we expect an analysis of this system?

Dr. WILLIAMS. The Washington State FOODLINK project began in September 1993. It is planned for the project to conclude in December 1994. At that time an analysis will be done to determine the applicability of expanding aspects of the project to other states and locations.

Mr. DURBIN. What is the status of the Hazard Analysis and Critical Control Point model educational programs that were near completion last year?

Dr. WILLIAMS. The model for development of HACCP systems in retail food operations being developed at the University of California-Davis, in cooperation with 13 retail food operations in California, was completed and distributed nationally. Numerous requests for the written materials have been received from supermarket managers nationwide, industry trade associations, the U.S. Food and Drug Administration, and other interested parties.

A model for small locker and meat processing plants for raw beef products being developed at Kansas State University is operating with the test facility chosen for development of the model, the Kansas Correctional Facility Meat Plant in Ocalaosa, KS. As the meat industry in Kansas became aware of the program, many requests have been received for assistance in implementing HACCP in various plants. The final report of the initial project is being printed this month, March 1994. It contains many generic HACCP model plans for different products and will be distributed nationally.

The model program to train catfish producers and processors in Mississippi about HACCP was completed. An instructor's manual and introductory videos, "Overview of the HACCP System" and "Application of the HACCP System to Catfish Farming and Processing" are available for those wishing to educate catfish producers and processors. The Veterinary Health Council of the Pan American Health Organization requested permission to translate the video into Spanish.

In addition to getting HACCP programs operating in some processing plants, providing technical assistance to plants, and providing tested educational resources to CES and industry educators, these and other HACCP-related programs of the CES have been shared with other federal agencies such as FDA and FSIS as they work on HACCP development plans and potential regulations.

Mr. DURBIN. What did the Extension Service do in fiscal year 1993 to assist in the Food Safety Inspection Service's Nutrition Labeling and Education Initiative? What are your plans for 1994?

Dr. WILLIAMS. Extension staff have been involved in presentations at two conferences put on by FDA/FSIS's National Exchange for Food Labeling, Education, NEFLE, and are active in the coordinating organization FLEDG, Food Labeling Education Dialogue Group. Both of these groups are a coalition of public and private organizations interested in effective efficient food label education. Extension worked with FDA and FSIS to put on a satellite video education program soon after the regulations were issued and has plans to do another program after May, 1994. Extension professionals have developed educational materials on food labeling that are on file with NAL's Food Labeling Education Information Center which is funded by FSIS and FDA.

SUSTAINABLE AGRICULTURE

Mr. DURBIN. Congress provided funding in fiscal year 1994 to initiate a sustainable agriculture program. This \$2.9 million was used to address the activities described in Chapter 3 of Subtitle B of the

1990 Farm Bill. For the record, please describe this Chapter in detail and tell us, specifically, how these funds are being used.

Dr. WILLIAMS. Title 16, Subtitle B provides for Sustainable Agriculture Research and Education. The Subtitle includes chapters on Best Utilization of Biological Applications; Integrated Management Systems; and Sustainable Agriculture Technology Development and Transfer Program.

Chapter 3 includes Section 1628 regarding Technical Guides and Handbooks and Section 1629 establishing a National Training Program for Cooperative Extension Service agents and other professionals. Section 1629 (b) states ". . . The National Training Program shall be organized and administered by the Extension Service, in coordination with other appropriate Federal agencies . . ."

Additionally, Section 1629 (d) provides for Regional Training Centers. Not less than two shall be administered by entities that have a demonstrated capacity relating to sustainable agriculture and make use of information generated by the Department of Agriculture and the State agricultural experiment stations and the practical experience of farmers.

The FY 1994 funding will be provided to our partners in the State Extension Services, who, in consultation with the Sustainable Agriculture Research and Education, SARE, Regional Administrative Councils, State Sustainable Agriculture Coordinators and State strategic planning teams will provide funds, through a project proposal process to the entities described in Chapter 3 for sustainable agriculture education, training, and demonstration programs. An equal amount will be going to all State Extension Services to develop a strategic plan for sustainable agriculture.

Mr. DURBIN. The increase of \$2.0 million you are requesting for the program in fiscal year 1995 will be used to address Chapter 2 of Subtitle B of the 1990 Farm Bill. Also for the record describe this Chapter in detail and tell us, specifically, how the increase will be used.

Dr. WILLIAMS. Chapter 2 provides authorization for the Secretary to establish a research and education program concerning integrated resource management and integrated crop management in order to enhance research related to farming operations, practices and systems that optimize crop and livestock production potential and are environmentally sound. Section 1627 calls for the Secretary to encourage the adoption of these integrated practices by producers and for the development of site-specific, individual programs designed to benefit producers and consumers.

The increase of \$2.0 million is requested to address integrated management systems reflected in Chapter 2 of Subtitle B. Funds would be used to provide opportunities for the State Extension Services to illustrate specific technologies, practices, new crops, and new uses and production systems integration into holistic farming and ranching operations. Efforts would be made to further develop comprehensive databases and decision support systems. Funds would be distributed on a project proposal merit basis.

RURAL HEALTH AND SAFETY EDUCATION

Mr. DURBIN. Funding was provided in fiscal year 1994 to address the shortage of rural health care professionals. A Rural Health and

Safety Education program is being conducted by the Cooperative Extension System and the Community Colleges in the State of Mississippi. How is the initial funding of \$2.0 million being used and what impact is this having on health care in Mississippi?

Dr. WILLIAMS. The initial funding is being used to establish the Mississippi Rural Health Corps, a program of the fifteen Mississippi community and Junior Colleges to increase the number of nurses, licensed practical nurses, and other health care professionals with up to three years commitment to work in a rural health care service, and an Extension health education and community health services strategic planning program. The program enrolled approximately 400 health care profession students in the first year. Health fairs and other health education and screening efforts have begun to make people more aware of their health risk status and the need to adopt healthier lifestyles and risk reduction behaviors. The overall impact of the program on health care in Mississippi will not be determined until students now enrolled in the program matriculate into rural health care employment. I will provide a breakout of the funding for the record.

[The information follows:]

In the first year of the program, the funding was used in the following ways:

Tuition stipends for community college health care students	\$937,517
Extension health promotion and community development education	161,910
Interactive video system and essential lab equipment	673,958
Project administration, operation, and supervision	146,615
Federal Administration	80,000
<hr/>	
Total	\$2,000,000

Mr. DURBIN. An increase of \$250,000 is proposed to expand the project in Mississippi. What are the long-term goals of this program?

Dr. WILLIAMS. The long-term goals of this program are to determine the feasibility of increasing the availability of health care professionals in rural areas, using state-of-the-art distance learning techniques, and to determine the effect of comprehensive health education and community health services strategic planning on rural communities' abilities to meet their family and individual health care needs.

Mr. DURBIN. Is there a shortage of health care professionals nationwide? If so, what is the need. Do you plan to expand this program to meet this need?

Dr. WILLIAMS. There is a severe shortage of rural health care professionals nationwide. This shortage has been extensively reported in the 1990 report, "Health Care in Rural America," issued by the Office of Technology Assessment, Congress of the United States; and in "Health Care Needs in Rural Areas: Recruitment and Retention of Physicians and Other Health Care Personnel," Hearing before the Task Force on Human Resources of the Committee on the Budget, House of Representatives.

Since this is still a pilot program, and it will be another two years before program graduates begin entering rural health care professions and the program can be evaluated on its ability to increase the supply of rural health care professionals, no plans have been made to expand this program at this time.

AG IN THE CLASSROOM

Mr. DURBIN. The budget request includes a proposal to transfer the Agriculture in the Classroom program from the Cooperative State Research Service to the Extension Service. Describe to the Committee what this program is and the reason it is being proposed for transfer.

Dr. WILLIAMS. The mission of Ag in the Classroom is to help students in grades K-12 acquire the knowledge needed to become agriculturally literate. The objective of Ag in the Classroom is to encourage educators to teach more about our food and fiber system, and the critical role of agriculture in our economy and society.

The Ag in the Classroom program is proposed to be transferred from CSRS to ES because CSRS deals primarily with higher education, while the 4-H Program of the Extension Service is better equipped to address kindergarten through 12th grade.

CHILDREN'S NUTRITION RESEARCH CENTER

Mr. DURBIN. At this time last year, Extension was getting ready to sign a Memorandum of Understanding with ARS and the Children's Nutrition Research Center in Houston. Please describe this initiative in further detail.

Dr. WILLIAMS. We are very pleased with the progress on this initiative. The Memorandum of Understanding was signed in March 1993, and we selected a Food and Nutrition Specialist to start the partnership. The purpose of this partnership is to facilitate the interface between nutrition research and nutrition education and to provide leadership for educational efforts related to maternal and child health. By disseminating the latest research findings to Extension educators in all 50 states and the U.S. territories, their teaching in local communities can reflect the best knowledge available for positive pregnancy outcomes. This communication is also planned to include a feedback mechanism in which issues which need additional research are identified at the local level and then fed back into the system which determines research priorities.

This first year effort has been successful. During this past year, positive working relationships were established with the CNRC staff, a needs assessment to identify future directions for training and research dissemination was conducted, linkages with other community organizations were made and new technology transfer methods such as satellite conferencing were explored. The partnership is yielding benefits for all three parties—the CES, the ARS and Children's Nutrition Research Center operated by Baylor College of Medicine.

FARMERS/NON-FARMERS

Mr. DURBIN. What percent of your 1993 budget did you spend on helping farmers solve on-farm problems and what percent was spent on helping non-farmers?

Dr. WILLIAMS. Approximately 47 percent of our total resources nationwide are spent on helping farmers solve on-farm problems. The remaining 53 percent pertains to other types of programs.

MATCHING FUNDS/NON-FEDERAL

Mr. DURBIN. With the extremely tight fiscal constraints we are facing, it is important to direct the limited resources we have to programs that give us more bang-for-the-buck in return. Report language was included last year encouraging applicants for section 3(d) funds to develop matching funds from non-federal sources. What is the status of this issue?

Dr. WILLIAMS. The matching requirement has its foundation in the Smith-Lever legislation, and the States are continuing to make efforts to develop matching funds from non-Federal sources. The recently funded programs that call for matching funds from non-Federal sources have been implemented and successfully conducted. The trend seems to be toward more of these collaborative efforts in order to focus resources on critical issue.

DISASTER ASSISTANCE

Mr. DURBIN. Congress provided the Extension Service with \$3.5 million in the 1993 Disaster Assistance Supplemental to provide assistance to those affected by the Midwest floods and other natural disasters. Of this amount, \$2.9 million was used in nine Midwestern States. Would you provide the Committee with some examples of how this funding was used?

Dr. WILLIAMS. The \$2.9 million was used in the nine Midwestern States impacted by flooding and excessive rainfall to provide educational programs that assisted people in identifying sources and applying for emergency assistance and other forms of aid. Electronic communication networks were used to coordinate activities and share disaster-related information. Reports from two-thirds of the affected states indicate that over 49,000 households were assisted.

This assistance included: Water/flood/feed contamination and testing, 34 percent; farm/business financial assessment and planning, 33 percent; personal/family management and counseling, 27 percent; and structural damage assessment and planning, 6 percent.

Over 10 percent of the funding was allocated to youth projects. Specific activities involved over 2,800 youth providing care for children and the elderly, working on restoration of community facilities, and participating in related activities. More than 1,250 communities were assisted with damage assessment and planning for replacement of community facilities and infrastructure.

Among the many specific examples of how funds were used are: Disaster assistance centers in Missouri where Extension worked side-by-side with FEMA, the Red Cross, and the Salvation Army to provide information on contamination of water, food and feed supplies; hot line assistance, distribution of fact sheets and individual counseling through eight flood assistance centers in Iowa; hiring of temporary professionals in Kansas who provided intensive assistance to farmers, families and businesses on financial aid, family stress and issues involving children; well decontamination demonstrations and distribution of fact sheets on a wide range of flood related topics in Illinois; assistance to South Dakota producers in handling livestock wastes and testing runoff; and interactive video

conferences on diseases in grains, and financial counseling and mediation in North Dakota.

Mr. DURBIN. How was the remaining \$600,000 used?

Dr. WILLIAMS. The remainder of the 1993 Disaster Assistance Supplemental was used to provide educational assistance to five Southeastern States impacted by severe drought in the summer of 1993. The primary focus of these projects was on assistance to farmers, families and businesses in financial management and planning, managing stress and identifying ways to use drought stressed crops to meet feed requirements in the most effective ways possible. Satellite broadcasts, the media, publications and workshops were used to deliver the educational programs to the public. Activities in the affected area were coordinated through regional training conferences.

COST BENEFIT RATIO

Mr. DURBIN. An analysis documenting Extension's contributions in terms of cost/benefit ratios over the period 1950 to 1982 was done. This analysis showed that, for an investment of one dollar in crop-oriented Extension programs, an increase of \$5.90 to \$8.62 in the value of crops sold was realized. Similarly, for an investment of one dollar in livestock-oriented Extension programs, an increase of \$4.60 to \$5.80 in the value of livestock sold was realized. Has an analysis been done on data from 1983 to the present?

Dr. WILLIAMS. This study was done externally, not within the Cooperative Extension Service. The source is a book entitled "Science for Agriculture: A Long Term Perspective," by Wallace Huffman and Robert Evenson that was published by Iowa State University Press in 1993. To our knowledge there has been no analysis for the years 1983 to present.

PARENTING EDUCATION

Mr. DURBIN. The explanatory notes mention that parent education programs were provided to over 530,000 adults in 22 states in 1990. These programs were designed to reduce academic, physical, social, and emotional problems among children. Were these programs continued in subsequent years? If not, why not? If so, at what funding level?

Dr. WILLIAMS. Parenting Education is an ongoing effort for Extension Service and an important part of our Youth At Risk and Plight of Young Children Initiatives. In 1992, 31 states and territories reported on conducting parenting and family-youth programs. Programs measured actual increased use of effective parenting skills, improved parent-youth relationships, family coping and improved financial management practices. These programs were funded from regular Smith-Lever funding to the states at an estimated cost of approximately 31 million dollars. Currently, parenting education programs are being conducted with military families in collaboration with the military family community service programs. Extension has received additional funding from the Department to help with the Department's downsizing and increased needs for family support.

URBAN GARDENING

Mr. DURBIN. In fiscal year 1994, the Smith-Lever 3b&c formula funding was increased to include funding for the urban gardening program. How many States are operating an urban gardening program?

Dr. WILLIAMS. All States have ongoing urban gardening programs in fiscal year 1994. However, very few have maintained the concentration of funding for the specific sites funded through the 3(d) program.

Mr. DURBIN. For the record, please update the table that appears on page 263 of last year's hearing record, showing the funding level and number of participants and volunteers for the program, both Federal and non-Federal, to include fiscal year 1993 actuals and fiscal year 1994 estimates.

Dr. WILLIAMS. We can not estimate the results of the fiscal year 1994 program at this time. States are not required to make estimates since the funds were incorporated into Smith-Lever 3b&c and distributed through that formula. Under present guidelines, they are not required to report program accomplishments and impacts as those identified cities/States did in the past. I will provide additional information for the record.

[The information follows:]

Fiscal year	Federal funds	Non-Federal funds	Number of participants	Number of volunteers
1986	3,329,000	N/A	225,466	3,690
1987	3,329,000	1,341,000	199,357	3,857
1988	3,329,000	1,642,000	188,243	3,007
1989	3,500,000	N/A	197,332	3,206
1990	3,474,000	1,438,000	196,281	2,535
1991	3,557,000	1,901,000	167,275	2,425
1992	3,557,000	942,000	144,002	2,188
1993	3,557,000	2,523,000	173,615	3,463

EXTENSION AGENTS/OVERSEAS

Mr. DURBIN. How many Extension agents do you have assigned overseas, where are they, and what are they doing in these countries?

Dr. WILLIAMS. The Extension Service has about 25 State Extension personnel on overseas assignments. In recent years, most of these employees have been on six-month assignments assisting emerging democracies in Eastern Europe and the former Soviet Union including Poland, Russia, Armenia, Bulgaria and Afghanistan. The objective has been to assist in establishing Extension programs and in providing their newly privatized farmers with the skills necessary to manage a farm successfully in a market economy. County agents and specialists who return from such assignments have been able to use their overseas experience to strengthen and enrich the programs they provide for their American clientele.

WORKPLACE ENHANCEMENT

Mr. DURBIN. What is the status of the Workplace Enhancement program, a five-year plan to implement an interagency electronic data and computer system?

Dr. WILLIAMS. This ongoing effort is nearly complete. The final piece should be completed this fiscal year. The major portion of the WorkPlace Enhancement budget for this year was maintenance.

FORMULA FUNDS

Mr. DURBIN. Please update the table that appears on page 272 of last year's hearing record, showing the amount requested and the amount appropriated for the basic formula funds to include fiscal year 1994.

Dr. WILLIAMS. I will provide the information for the record.
[The information follows:]

SMITH-LEVER 3(b)&(c) FUNDS

[In thousands of dollars]

	President's budget	Actual appropriation
1983	\$219,376	\$230,376
1984	230,376	234,984
1985	241,484	241,484
1986	241,484	229,713
1987	127,547	236,213
1988	237,594	241,594
1989	228,483	241,594
1990	241,594	242,272
1991	246,535	252,608
1992	262,100	262,712
1993	262,712	262,712
1994	266,657	272,582

RURAL DEVELOPMENT CENTERS

Mr. DURBIN. Please update the table that appears on page 281 of last year's hearing record, indicating how each of the Rural Development Centers allocated their funds, to include fiscal year 1994 estimates. Also, tell us where each of these centers is located.

Dr. WILLIAMS. I will update that table for the record.
[The information follows:]

RURAL DEVELOPMENT CENTERS

	Fiscal Year		
	1992	1993	1994
North Central Regional Center for Rural Development: (Iowa State University)			
Personnel.....	\$ 72,998	\$ 71,247	\$ 71,247
Travel and subsistence.....	42,000	6,000	6,000
Publications (educational materials).....	58,000	15,000	15,000
Current expense (supplies, eqpt.).....	15,000	7,800	7,800
Subcontracts and agreements with other institutions	0	89,243	89,243
Computer.....	<u>1,300</u>	<u>0</u>	<u>0</u>
Total.....	189,298	\$189,290	\$189,290
North Dakota Institute for Business and Industry Development: (North Dakota State University)			
Personnel.....	170,016	182,400	182,400
Publication/printing costs.....	6,392	0	0
Other costs.....	<u>6,000</u>	<u>0</u>	<u>0</u>
Total.....	182,408	182,400	182,400
Northeast Regional Center for Rural Development: (Pennsylvania State University)			
Personnel.....	53,900	89,889	89,889
Travel.....	15,000	15,401	15,401
Equipment and supplies.....	8,000	8,000	8,000
Center-funded projects.....	112,398	60,000	60,000
Publication/printing costs.....	<u>0</u>	<u>16,000</u>	<u>16,000</u>
Total.....	189,298	189,290	189,290
Southern Rural Development Center: (Mississippi State University)			
Personnel.....	82,946	90,494	90,494
Travel.....	25,000	25,000	25,000
Other (fringe benefits).....	18,248	27,148	27,148
Materials and supplies.....	15,000	20,000	20,000
Contractual.....	<u>48,104</u>	<u>26,648</u>	<u>26,648</u>
Total.....	189,298	189,290	189,290
Western Rural Development Center: (Oregon State University)			
Personnel.....	133,242	150,973	150,973
Travel (staff).....	7,000	7,000	7,000
Office expenses and publications.....	7,000	5,000	5,000
Equipment and other expenses.....	0	0	0
Other operating expenses (seed, CAP, and ACT projects).....	<u>42,056</u>	<u>26,317</u>	<u>26,317</u>
Total.....	189,298	189,290	189,290

Mr. DURBIN. During 1990 and 1991, 16 demonstration projects were initiated to demonstrate the effectiveness of selected agricultural production practices in treating non-source pollution problems. A brief summary of each project was provided for the record last year. Would you update the status of these projects to include when you expect them to be completed and any preliminary results you have.

Dr. WILLIAMS. We currently are completing an interagency assessment of the status of each of the eight projects initiated during FY 1990. We will complete the same assessment for each of the eight projects initiated during FY 1991 next year. As you will recall these projects were implemented with a planned 5-year program effort. Our assessment is reviewing the status of each project to determine if it has achieved its objectives. The agencies working with us in this assessment are the Soil Conservation Service, the Agricultural Research Service, the Cooperative State Research Service, the Environmental Protection Agency, the Tennessee Valley Authority, the Geological Survey, and the National Association of Conservation Districts. Each assessment will also provide the basis for recommending the completion of each of the projects or to extend them to allow for the cost-effective achievement of their objectives.

WATER QUALITY

Mr. DURBIN. A total of 24 projects is included in the Department's Water Quality Plan. As I understand it, the eight remaining projects were deferred pending an assessment of the current projects. When can we expect this assessment?

Dr. WILLIAMS. We are currently completing the assessment of current demonstration projects. We anticipate that the interagency reviews will be completed and the final recommendations made by early to mid June.

YOUTH AT RISK

Mr. DURBIN. How many projects were funded under the Youth-at-Risk program in fiscal year 1993 and how many are proposed to be funded in fiscal year 1994? Please provide a list for the record.

Dr. WILLIAMS. In FY 1993, 96 projects were approved. In FY 1994, we anticipate 102 projects will be funded. I will provide a list of the 1993 projects for the record.

[The information follows:]

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FY 1993 YAR Proposals Funded

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State	Project Title
ALABAMA	Address and Address: Meeting the Needs of High Risk Youth
ALASKA	4-H Yukon Fisheries Education and Youth Development Program
ALASKA	Kuskokwim 4-H Fisheries Education And Youth Development Program
ARIZONA	Phoenix Coalition for Youth and Families
ARKANSAS	SAIL (Summer Adventures in Learning)
CALIFORNIA	4-H AM/PM Club - Chula Vista
CALIFORNIA	Reading and Science Literacy for at-Risk Youth (SERIES)
CALIFORNIA	School Age Child Care Education
CONNECTICUT	Bridgeport R.I.S.E.
CONNECTICUT	New Britain/Slade Middle School After School Program
CONNECTICUT	School-Age Child Care in Hartford, Connecticut
CONNECTICUT	The New Haven SPACES Initiative
DELAWARE	Seaford Collaboration for Youth
DELAWARE	WCASA Community Partnerships
FLORIDA	Focus on the Future: Enhancing Literacy Through Technology
GEORGIA	Calhoun/Gordon County Shuttle School
GEORGIA	Project KITE
GUAM	Project Youth Empowerment
HAWAII	A.C.T. (Acting Collaboratively Together)
IDAHO	4-H Adventures Club (Just for Kicks)
IDAHO	After School Adventures, Youth Mentoring and Early Tech Program
IDAHO	School Age Child Care and Parenting Resources
ILLINOIS	Computer Assisted Learning

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State	Project Title
ILLINOIS	SACC and Parent Educ. for Aledo, Sherrard, and Westmar Schools and Communities
ILLINOIS	Youth at Risk School Age Child Care and Family Enrichment
INDIANA	Space Station Indiana
IOWA	Community Parenting Coalition Targeting High Risk Youth
IOWA	Model City/Woodland Willkie Literacy Project
IOWA	Postville Child Care--A Rural Model for Before and After School Care
KANSAS	Caring and Collaborating for Youth/Pottawatomie County
KANSAS	Kids After School: Reno County, Kansas
KANSAS	Responsive Educational Approach to Diversity
KENTUCKY	Gerrard County Child Care Program
KENTUCKY	Harlan Youth Employability
LOUISIANA	4-M Horizon Program
MAINE	Strategies for Developing SACC and Education in Rural Maine
MARYLAND	4-M Adventure in Science
MASSACHUSETTS	YAR Programming in Worcester County, MA
MICHIGAN	All For One: Pottengill Area Reading, Math, and Science Literacy Coalition
MICHIGAN	Literacy and Technology Literacy for Youth at Risk
MICHIGAN	Say Y.E.S. to Willow Run
MINNESOTA	On the Move...for Minnesota Families
MINNESOTA	Project FINE (Focus on Integrating Newcomers into Education)
MINNESOTA	Youth Issues Education
MISSISSIPPI	4-M Project SOARS
MISSISSIPPI	After School Child Care and Education
MISSISSIPPI	Project GESTALT

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State	Project Title
MISSOURI	4-H Adventure Club
MISSOURI	St. Joseph Youth Alliance: Targeted Prevention/Intervention Coalition
MISSOURI	Students Taking Academic Initiative for Reading Success (STAIRS)
MONTANA	Native American Family Empowerment Project
NEBRASKA	13 Days - 13 Kids (They changed title to "Kids Team")
NEBRASKA	GET SMART: Girls Expanding Thinking in Science Math and Relevant Technology
NEVADA	Building Communities of Support for High Risk Youth in Isolated Rural NV
NEVADA	Choices and Challenges for Youth
NEW HAMPSHIRE	Youth Opportunities Unlimited: Comprehensive School Age Child Care Program
NEW JERSEY	4-H After School Education in Newark Housing Complexes
NEW JERSEY	Bergen-Lafayette Upscale Project for Youth
NEW JERSEY	Camden City Community Garden Program
NEW MEXICO	From Roots to Wings (Guay County Youth Partnership)
NEW YORK	Make a Difference Program for Youth
NEW YORK	Rural Families Cooperative - After School Child Care Program
NEW YORK	School's Out-School Age Child Care Program
NORTH CAROLINA	Wayne County 4-H High Risk Programming in an After School Setting
NORTH DAKOTA	The Rural School and Community Development Project
OHIO	Athens County Coalition Enhancement Project
OHIO	Cleveland Peer Volunteer Development Coalition
OHIO	Community Councils for Youth at Risk - Clermont County
OHIO	Knox County After School Day - Care Program
OKLAHOMA	Coalition for After School Care for High Risk Indian Youth
OKLAHOMA	Home Visitation Program for Adolescent Mothers

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FY 1993 YAR Proposals Funded

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State	Project Title
OREGON	4-M Kid Konnection
OREGON	Mill City/Gates 4-M Youth Development Project
PENNSYLVANIA	Youth Educational Programs in Coatesville
PUERTO RICO	Vieques Kids in Action for Science Education
RHODE ISLAND	R.I. CE School Child Care Education
SOUTH CAROLINA	Choices (Children Having Opportunities to Increase Their Chances for Educational
SOUTH DAKOTA	After School Child Care
SOUTH DAKOTA	Pine Ridge Youth Coalition and Center
TENNESSEE	4-M BEST (Building Esteem Through Science and Technology)
TEXAS	4-M C.A.P.I.T.A.L. Project
TEXAS	Making the Grade - Victoria
TEXAS	The OLE! Project: 4-M School Age Lit. Education Program for Hispanic Youth
UTAH	Project CARES (Children at Risk Extended School)
VERMONT	Enhancing Community Awareness
VIRGINIA	Bailey's Community "Making the Grade" Project of Fairfax County
VIRGINIA	Science/Technological Literacy Edu. for High Risk Youth in Giles County, VA
VIRGINIA	Strong Families, Competent Kids and Caring Communities
WASHINGTON	High Risk Youth Program - ONTU 4-M Challenge
WASHINGTON	Salishan Together for at Risk Youth (STAR) Youth Project
WASHINGTON	Spokane Family Focus School Age Child Care Project
WEST VIRGINIA	Dev. Youth Potential: Enabling YAR to Become Healthy Prod., Contrib. Adults
WISCONSIN	National Center for Action in Community-Based Action Research
WISCONSIN	Wisconsin Youth Futures

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FY 1993 YAR Proposals Funded

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State	Project Title
WYOMING	Healthy Infant Capable Adolescent Project
WYOMING	Wind River Indian Reservation Youth and Family At-Risk Project

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Number of Projects funded: 96

YOUTH-AT-RISK PROGRAM

Mr. DURBIN. How many applications did you receive in both fiscal years 1993 and 1994?

Dr. WILLIAMS. In FY 1993, 110 applications were received. In FY 1994, 113 applications were received.

Mr. DURBIN. The six Centers for Action which provide nationwide technical assistance for the program were funded by a three year grant from the W.K. Kellogg Foundation. This funding ended in fiscal year 1993? Are these Centers still operating? How are they being funded?

Dr. WILLIAMS. Six Centers for Action funded by the W.K. Kellogg Foundation have provided technical assistance to the Youth at Risk, YAR, projects for the past three years. Services to these community based programs for at risk youth and families, have included training, curriculum, and consultation on program development, implementation, and evaluation.

Part of the Youth and Families At Risk funding is being used to continue four National Networks in 1994. These National Networks focus on Collaborations, Child Care, Science and Technology, and Family Resiliency and, together with a nationwide electronic distributed information infrastructure, form the National Extension CHILDREN, YOUTH AND FAMILY, CYF, NETWORK.

The CYF NETWORK consolidates program and technology resources and, through the electronic infrastructure, expedites nationwide access to information and education. The CYF NETWORK is not centered in Washington or in individual states. Each Network includes faculty with diverse experiences and skills from 4-H Youth Development, Home Economics, Community Development, Communications Technology, and other University departments from at least nine Land Grant universities. Services of the CYF NETWORK will be concentrated on 95 ES-USDA funded Youth at Risk (YAR) local projects and simultaneously be available to all states and counties.

INDIAN RESERVATIONS

Mr. DURBIN. Please provide the Committee with some specific examples of how the funds appropriated for Extension agents on Indian reservations are used.

Dr. WILLIAMS. The funds appropriated for the Extension Indian Reservation Program are used in a variety of ways according to proposals sent in to Extension Service. These proposals were reviewed and funded on the basis of merit. The proposals themselves had to be agreed upon by the Reservation/Tribe in which the program was to be carried out.

In Arizona there are programs with the Colorado River Indian Tribes, Tri-State Navajo Nation, and the San Carlos Apache Indian Reservation. The Colorado River Indian Tribes program encompasses agriculture and 4-H youth development and focuses on efficient water use and quality, new crops, management, marketing, and in the youth area on developing self-esteem and contributors to their culture and tribe, as well as, society in general.

The Tri-State (AZ, NM, UT) Navajo Nation project is also an agriculture and 4-H youth program targeted to agricultural produc-

ers so that they may increase profitability of their farm/ranch units, and to youth for their development into productive citizens. The San Carlos Apache program proposal was put together with input and support from the Southwest Indian Agriculture Association. Targeted groups are agricultural producers and youth. Producers will increase profitability to help develop and increase individual and Tribal self-sufficiency. Youth are being given the opportunity to become productive citizens through strong educational programs within their cultural framework and that of society in general.

In Florida, the program with the Seminole Tribe provides technical assistance, information, and educational programs in cattle production, citrus grove development and management, hog raising, and financial management. Food and nutrition and vegetable growing topics are also included.

In the Seneca Nation project in New York, the emphasis is on food, diet, and nutrition, parenting, and child development, and on youth.

Indian-net, an electronic mail group, has been formed by Washington which acts as the systems management. Electronic mail via Indian-net is constantly being used by program participants and Extension Service staff.

Mr. DURBIN. How many projects were funded in fiscal year 1993 and how many are planned for fiscal year 1994?

Dr. WILLIAMS. Thirty projects were funded in 1993 and about the same number will be funded in 1994.

Mr. DURBIN. Were any requests for assistance turned down due to lack of funding?

Dr. WILLIAMS. In 1993 there were requests totalling around \$800,000 that were not funded. In 1994, the amount requested exceeded the available funds by \$200,000.

Mr. DURBIN. How much in matching funds were provided to this program?

Dr. WILLIAMS. The matching funds for FY 1993 for this program totalled \$285,000 for 29 projects. The total matching funds awarded per project ranged from \$3,900 to \$40,000 with an average of \$9,800 per tribe.

CHINCH BUG/RUSSIAN WHEAT APHID

Mr. DURBIN. Please provide a description of the program that has been funded under the project entitled, Management of the Chinch Bug and Russian Wheat Aphid in Nebraska.

Dr. WILLIAMS. This project is involved with the demonstration of management options available to Nebraska farmers for the chinch bug on sorghum and the Russian wheat aphid on wheat.

Mr. DURBIN. What is the national, regional, or local need for this project?

Dr. WILLIAMS. This project addresses a local issue. The chinch bug is a serious but cyclical pest of sorghum and corn in the central great plains with traditional infestation hot-spots in the southeastern quarter of the state of Nebraska. High chinch bug populations can cause severe crop damage for three to four continuous years followed by a population crash for three to five years before they increase again to economic damaging levels. The Russian wheat

aphid is a recently introduced, destructive pest of wheat and barley in the western Great Plains that since 1988 has caused localized, but severe crop loss in the western one-third of the state of Nebraska. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this project and what has been accomplished to date?

Dr. WILLIAMS. The original goal of this project was to demonstrate the most effective techniques of managing these insect pests to Nebraska sorghum, corn, and wheat producers. To date, management demonstrations have been conducted for both the chinch bug and the Russian wheat aphid.

Mr. DURBIN. How long has this work been underway and how much has been appropriated through fiscal year 1994?

Dr. WILLIAMS. This work began in the spring of 1993, so the second year of this project is just underway. A total of \$67,000 was appropriated in FY 93 and \$67,000 has been appropriated for FY 94.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. In FY 1993, State funding from the University of Nebraska provided to support this project included \$20,000 for P.I. Salaries (0.20 FTE) and \$40,000 for facilities and other overhead costs for a total of \$60,000.

In FY 1994 State funding from the University of Nebraska will be provided at the same level as 1993 to support this project.

Mr. DURBIN. Where is the work being carried out?

Dr. WILLIAMS. The chinch bug portion of the work is being conducted in the southeastern portion of the state of Nebraska where this insect is an economic concern in sorghum production. The Russian wheat aphid work is being conducted in the western portion of the state of Nebraska where this insect is an economic concern in wheat and barley production.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. This work will be completed at the end of FY 1996. Funds for this project are not processed in the 1995 budget, although Nebraska could use Smith-Lever 3b&c funds at its discretion.

CRANBERRY DEVELOPMENT (ME)

Mr. DURBIN. Please provide a description of the program that has been funded under the Cranberry Development project in Maine.

Dr. WILLIAMS. The objective of this program is to provide growers who are beginning to establish cranberry bogs in Maine with the management skills necessary for a successful operation.

Mr. DURBIN. What is the national, regional, or local need for this program?

Dr. WILLIAMS. The program is of local interest in the State of Maine, principally in the Washington and Hancock Counties where the new cranberry farms are located. In view of significant needs

for extension efforts in high priority national interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. This is a new program beginning in February 1994 at a level of \$46,000. The goal is to educate growers and Extension faculty on cranberry culture.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. Maine Cooperative Extension will contribute \$23,865 to the project.

Mr. DURBIN. Where is work being carried out?

Dr. WILLIAMS. In Washington and Hancock Counties in the State of Maine.

Mr. DURBIN. When do you anticipate the work will be completed?

Dr. WILLIAMS. The completion date for the project is September 30, 1995.

PRESQUE ISLAND (ME)

Mr. DURBIN. Please provide a description of the program that has been funded under the Presque Isle IPM project in Maine.

Dr. WILLIAMS. The objective of this special project is to enhance the capabilities of the University of Maine Cooperative Extension's ability to bring sustainable agriculture, pesticide, and integrated pest management educational information to the public.

Mr. DURBIN. What is the national, regional, or local need for this program?

Dr. WILLIAMS. This project enhances the local scope (Maine) of IPM and sustainable agriculture programs. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The objective of this special project is to enhance the capabilities of the University of Maine Cooperative Extension's ability to bring sustainable agriculture, pesticide, and integrated pest management educational information to the public. This has been done by expanding pest monitoring and diagnostic methods, increasing field demonstration abilities and improving Extension's ability to provide quality educational teaching materials.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. This project began in fiscal year 1990 and has been ongoing since then. A summary of funding includes: FY 1990 \$139,000; FY 1991 \$130,000; FY 1992 \$175,000; FY 1993 \$175,000 (current grant in progress); FY 1994 \$175,000, for a total of \$794,000.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. Non-Federal funds for IPM Project include: FY 1990 \$40,000; FY 1991 \$42,800; FY 1992 \$39,060; FY 1993 \$52,845; FY 1994 \$71,466 for a total of \$246,171.

Mr. DURBIN. Where is the work being carried out?

Dr. WILLIAMS. Work is being carried out throughout the State of Maine, with three focal points. The Presque Isle Extension Office located in Aroostook County; it is from this office that the potato and broccoli Integrated Pest Management programs are operated. One hundred and fifty miles to the south is the Pest Management office. This is the Central office for the Integrated Pest Management Programs. It also houses insect and disease diagnostic laboratories and the operation of the Apple IPM program. The third IPM facility is located at the Highmoor Experimental Farm in Monmouth which is approximately 150 miles south of the Orono Pest Management office. From this office the sweet corn and strawberry IPM programs are operated.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. A specific termination date has not been established.

CROP SIMULATION (MS)

Mr. DURBIN. Please provide a description of the program that has been funded under the Crop Simulation project.

Dr. WILLIAMS. The crop simulation project involves demonstration of GOSSYM-COMAX cotton product model.

Mr. DURBIN. What is the national, regional, or local need for this research?

Dr. WILLIAMS. While the Cooperative Extension System does not actively participate in the basic research associated with this effort, we do work to demonstrate results and identify areas where additional research is needed. It is of interest in the cotton region. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal was to rapidly move basic research from the laboratory to the farmer to encourage more cost-effective and environmentally sensitive decisions.

The number of GOSSYM-COMAX users who have been trained and supported continues to increase. The number of acres under GOSSYM-COMAX management is estimated at approximately 500,000. The software has been enhanced greatly during this time. A graphical user interface—GUI—was implemented beginning with the 1990 release.

The training and understanding of the software has been greatly simplified with the GUI. The software has been moved into a state-of-the-art status and been of much greater value to the user by the enhancement of the GUI.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. This project was first funded in 1990. With 1994 funding, the total amount is \$2,492,000. Appropriations by fiscal year are: 1990, \$500,000; 1991, 498,000; 1992, 498,000; 1993, 498,000; and 1994, 498,000.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. This program has been supported only by federal funds.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The GOSSYM-COMAX decision support system is being offered to all cotton producing States. States that are currently active participants include: Alabama, Arizona, Arkansas, California, Florida, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.

Mr. DURBIN. When do you anticipate that the work will be complete?

Dr. WILLIAMS. We are striving to make this effort one which can be turned over to the private sector. The intent was to support GCIU for 5 years, and fiscal year 1994 represents the 5th and final year of support.

INCOME ENHANCEMENT DEMONSTRATION (OH)

Mr. DURBIN. Please provide a description of the program that has been funded under the Income Enhancement Demonstration Project for Northwest Ohio.

Dr. WILLIAMS. The Project helps farmers, food processors, and other local businesses explore and develop new or expanded business opportunities.

Mr. DURBIN. What is the national, regional, or local need for this program?

Dr. WILLIAMS. This program was designed to increase the potential income of farmers and other rural residents of Ohio. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal of the project was to evaluate income enhancement opportunities through adopting alternative agricultural enterprises, revitalizing the Toledo farmers' market, and expanding agribusiness companies. An Agricultural Business Enhancement Center was established. The Center provides in-depth educational programs and problem-solving assistance for existing and potential firms in the area. The Center assists firms in exploring new domestic and foreign market opportunities. It helped farmers and vendors organize the Farmers' Market Association of Toledo and now assists the Association in expanding the Toledo farmers' market. The Center relies on a local advisory committee for guidance and support.

Mr. DURBIN. How long has this work been underway and how much has been appropriate by fiscal year through fiscal year 1994?

Dr. WILLIAMS. I will provide that information for the record.

[The information follows:]

Fiscal year:	
1991	\$145,000
1992	250,000
1993	250,000
1994	250,000
Total	895,000

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. I will also provide that information for the record.

[The information follows:]

State of Ohio

Fiscal year:	
1991	\$35,100
1992	72,368
1993	56,930

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work is concentrated in the Toledo Ohio Metropolitan Area, including eight surrounding counties. Project leadership and data analysis is being provided by the Department of Agricultural Economics, Ohio State University, Columbus Ohio.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The current agreement with Ohio State University Extension provides funding through September 1994.

BEEF IMPROVEMENT (AR)

Mr. DURBIN. Please provide a description of the program that has been funded as the Arkansas Beef Improvement Program, ABIP.

Dr. WILLIAMS. The ABIP utilizes beef cattle farms to demonstrate cost-effective management practices.

Mr. DURBIN. What is the national, regional or local need for this program?

Dr. WILLIAMS. Management practices will change from farm-to-farm, region-to-region and State-to-State, but the decision-making process does not. Setting goals, evaluating resources and selecting the management practices that will help the cattle producer achieve those goals in the decision-making process. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal of the ABIP was to enhance the profitability and efficiency of Arkansas cattle producers.

Accomplishments to date include the establishment of demonstration farms, collection of benchmark data and renovation of pastures to increase grazing capacity.

Mr. DURBIN. How long has the program been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. I will provide the information for the record.
[The information follows:]

PERIOD OF TIME

Year 1: 3/92-2/93, \$184,000.

Year 2: 3/93-2/94, \$184,000.

Total: \$368,000.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. I will also provide this information for the record.
The information follows:]

Period of Time: 3/93 through 2/94, \$98,400—State matching funds.

Mr. DURBIN. Where is the work being carried out?

Dr. WILLIAMS. In a number of counties in Arkansas. I will provide a list for the record.

[The information follows:]

County	Number of beef cattle	Farm size (acres)
Columbia	29	400
Hempstead	170	920
Pike	110	250
Faulkner	21	130
Van Buren	20	99
Marion	40	320
Boone	130	600
Little River	27	140
Sebastian	35	140
Independence	75	600
Average	65.7	360

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. Five to seven years.

INTEGRATED COW/CALF MANAGEMENT (IA)

Mr. DURBIN. Please provide a description of the program that has been funded as CHIPS: Cow-Calif Resource Management Program.

Dr. WILLIAMS. CHIPS is an integrated cow-calf resource management program which targets an eleven county area in Southeast Iowa. The project seeks to impact the area's rural economy by maximizing profitability to Southeast Iowa's cattle industry.

Mr. DURBIN. What is the national, regional or local need for this program?

Dr. WILLIAMS. Southeast Iowa contains extensive areas of marginal lands which are highly erosive (HEL) and should not be intensively farmed with row crops. These rolling hills are capable for producing high quality forages and are supportive to the cattle industry. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the

discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The overall goal of CHIPS is to impact the area's economy by returning and maintaining long-term profitability to the local cattle industry. To address this broad project goal, CHIPS has set forth a number of objectives, including: improve profitability potential on cooperator farms; identify issues and trends in management data; raise the awareness and understanding of 2,000 agricultural producers in Southeast Iowa about cow-calf production on HEL and the integrated resource management concept; provide 50 producers (25 in 1992-93—addition 25 in 1993-94) with intensive technical assistance to develop goals and individualized farm plans, including pasture and forage management, rations, utilization of resources, record management systems, and compliance to government farm programs; and help producers develop management skills to improve efficiency and reduce costs of production as they implement individualized farm plans.

To date, over 50 cooperators (involving over 4,500 cows) are enrolled and participating in the CHIPS programs. Two full-time technicians have conducted over 300 farm consultations to develop on-the-farm evaluations, make specific management recommendations, and to assist with the problem solving and decision-making process. CHIPS personnel have been involved in 33 presentations, meetings, and workshops with over 700 people attending.

These programs involved a wide variety of educational efforts, with primary emphasis on nutrition, cost effective rational development, and cow production concerns. Over 20 of the CHIPS cooperators have incorporated the CHIPS Program and Beef Cow Business Record in their operations. Over 240 forage samples have been collected and analyzed.

Mr. DURBIN. How long has the program been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. The CHIPS Program received official notice in July, 1992. \$138,000 was approved for fiscal year 1992 and \$138,000 was approved for fiscal year 1993. Official notice has not been received for fiscal year 1994. So far, in total, \$276,000 has been appropriated.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. To date, approximately \$11,000 has been collected from CHIPS cooperators. Each CHIPS participant agrees to pay client fees of approximately \$3.00 per cow. This fee structure is on a sliding scale which adjusts for cow herd size.

Mr. DURBIN. Where is the work being carried out?

Dr. WILLIAMS. The CHIPS Program is currently being operated in Southeast Iowa and involves the following counties: Van Buren, Davis, Jefferson, Wapello, Appanoose, Monroe, Mahaska, Keokuk, Washington, Henry, Des Moines, and Wayne. Plans are being developed to expand the geographical area to South Central Iowa during fiscal year 1994.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. It is anticipated that the CHIPS program will continue through 1996.

SMALL FARM MANAGEMENT AND MARKETING EDUCATION (AR)

Mr. DURBIN. Please provide a description of the program that has been funded under the Small Farm Management and Marketing Education Project.

Dr. WILLIAMS. The Small Family Farm Management and Marketing Education Program provides farm financial management education and support materials necessary for development and maintenance of an effective financial management system for these operations.

Mr. DURBIN. What is the national, regional or local need for this program?

Dr. WILLIAMS. This program is targeted toward small farmers. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this project and what has been accomplished to date?

Dr. WILLIAMS. The original goal of the project was to develop a small/family farm management, financial management and marketing education program at the South Central Family Farm Research Center at Booneville, Arkansas which was established in 1990. Since its inception, the project has extended farm financial and management information to small family farmers in the target area. In 1992, over 3700 contacts were made with clients on these topics. Educational activities were conducted at field days, fairs and with high school students. In 1993, attention was focused on farm marketing strategies and problems at a similar level of activity. The Area Agent for Alternative Agriculture produced market reports, conducted financial management seminars, worked with the Sustainable Agriculture Network and ARS representatives on production practices and assisted agents with programs for local producers.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994.

Dr. WILLIAMS. The project has been underway since 1992. The amounts appropriated by fiscal year are: FY 1992, \$100,000; FY 1993, 100,000; and FY 1994, 100,000.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. The University of Arkansas Cooperative Extension Service provided non-federal matching funds to support this project in FY 1992, FY 1993 and FY 1994. The amounts are: FY 1992, \$59,040; FY 1993, 55,680; and FY 1994, 54,250.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work is being carried out in the area served by the South Central Farm Research Center located at Booneville, Arkansas.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The project supports work through the end of the current fiscal year.

SATELLITE LINK (PA)

Mr. DURBIN. Please provide a description of the program that has been funded under the Satellite Link project.

Dr. WILLIAMS. This is a pilot satellite communication project in Pennsylvania to link a three-county area: Cambria, Somerset and Westmoreland. The project consists of four parts: Establishing downlink sites in the three counties; establishing uplink capability at the Penn State College of Agriculture; funding of programs to be delivered on the system; and funding of a full-time position to manage and implement the project.

Mr. DURBIN. What is the national, regional or local need for this research?

Dr. WILLIAMS. The geography and demographics of this region range from urban to very rural, providing a wide array of potential audiences. Economic conditions in this area have been depressed and access to satellite educational programming is a significant asset to the region. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal of this project was to provide distance education opportunities to three counties in Pennsylvania. To date, downlink sites have been installed in Cambria and Somerset counties and are fully operational. The Westmoreland county site is awaiting construction of a new county building that will house the downlink site. Direct satellite uplink capability is fully operational at the College of Agriculture. Project funds have been assigned to twelve programs, with two completed and broadcast in February. A satellite coordinator was hired in August, 1993 and is housed at the Cambria County Extension office.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. The work has been underway since June of 1992. In fiscal year 1992, \$285,000 was appropriated. In fiscal year 1994, \$125,000 was appropriated for a total of \$410,000.

Mr. DURBIN. What is the source and amount of non-Federal funds provided?

Dr. WILLIAMS. In fiscal year 1992, state funds totalling \$31,736 were provided. It is estimated that in fiscal year 1994, state funds totalling \$31,736 will be provided.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The project is being carried out in Cambria, Somerset and Westmoreland counties and at the University Park campus of Penn State University.

Mr. DURBIN. When do you anticipate that the work will be completed.

Dr. WILLIAMS. The project will conclude on September 30, 1995.

RURAL REHABILITATION (GA)

Mr. DURBIN. Please provide a description of the program that has been funded under the Rural Rehabilitation project in Georgia.

Dr. WILLIAMS. The program has tested the feasibility of providing satellite-based adult literacy education, in association with vocational rehabilitation services, to handicapped adults in rural Georgia. The program has developed curriculum, tested and adapted technology, established student recruitment and retention strategies, expanded to Statewide coverage, and provided successful adult literacy education.

Mr. DURBIN. What is the national, regional, or local need for this program?

Dr. WILLIAMS. A state task force has estimated that 25 percent of Georgia's population is functionally illiterate. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal of this program was to prove that distance learning can be an effective tool for reaching and teaching functionally illiterate adults in rural areas.

This program has demonstrated that satellite-based literacy training, in cooperation with vocational rehabilitation services, can successfully provide adult literacy education for handicapped rural adults. The program now enrolls about 625 students per quarter, with approximately 70 percent expected to complete the full eight quarters of literacy education. Over the past five years, test scores and attendance rates of students in the satellite-based program have shown that distance learning is an effective delivery system for instructing low-level readers and non-readers.

Test scores and attendance rates of students in this program have been comparable to those of students in traditional, urban classes.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. Funding for this program was initially appropriated in fiscal year 1989, and the program has been in operation since March 1989. Through fiscal year 1994, appropriations for this program have been: FY 1989, \$129,000; FY 1990, 256,000; FY 1991, 256,000; FY 1992, 256,000; FY 1993, 250,000; and FY 1994, 250,000; for a total of \$1,397,000.

Mr. DURBIN. What is the source of and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. The sources of non-Federal funds provided for this program are state appropriated funds from the Georgia Department of Adult Education and private contributions from the Woodruff Foundation and other local foundations. Through FY 1994, the total amount of non-federal funds provided the project has been \$3,005,761. The breakdown by fiscal year is: FY 1988, \$164,000; FY 1989, 270,500; FY 1990, 809,675; FY 1991, 656,765; FY 1992, 65,000; FY 1993, 1,019,821; and FY 1994, 20,000; for a total of \$3,005,761.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. This program is headquartered at the Center for Rehabilitation Technology, College of Architecture, Georgia Institute of Technology, from which the literacy instruction is provided. The 94 classes at 64 adult literacy classroom sites, dispersed throughout the State of Georgia, include 19 technical schools, 15 adult learning centers, 19 high, middle or elementary schools, 4 universities, 5 libraries, and 2 rehabilitation centers.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. Since these projects are funded on an annual basis, we usually estimate the completion date for the end of the fiscal year.

RURAL DEVELOPMENT (NE)

Mr. DURBIN. Provide a description of the program that has been funded under the Nebraska Rural Development Project.

Dr. WILLIAMS. The Nebraska Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, supports a small business information and technical assistance center which works with small-scale, independently owned businesses within the State of Nebraska. The activities of the Center were focused primarily on rural retail operations until 1992. Since this date, the major thrust of educational efforts and technical assistance has been directed to value-added processing of agricultural products and small agri-business firms. The current goals of the program include: stimulate the development of new food processing and value-added industries; assist existing firms to become more competitive; assist new and existing firms through educational programs developed for management and employees; and help commodity groups and state agencies in developing value-added export markets.

At present, the project is working with approximately 50 firms in the State and is providing consultative advice to other states on setting up similar programs.

Mr. DURBIN. What is the national, regional or local need for this research?

Dr. WILLIAMS. The Center is providing applied research to help small manufacturing firms survive economic restructuring. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The earlier work of the Center tagged "Managing Mainstreet" conducted a total of 72 workshop series in 67 communities to help merchants improve profitability and increase sales. These workshops were attended by 1,341 business owners/managers and represented 642 businesses. The current thrust in entrepreneurship and business development has successfully assisted the start up of 111 new businesses in the state during the past two years. At any given time, 40 to 60 firms are being assisted.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. The project has been operating since October, 1978, and Federal appropriations through 1993 were \$1.75 million. For 1994, a total of \$400,000 was appropriated.

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year.

Dr. WILLIAMS. All Federal funds have been matched by an equivalent amount of non-Federal funds each year of operation.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The project is based in Nebraska and supports the development of enterprises in that State. Research and operational knowledge for Center is being shared with other states in the regional and nationally.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. Current project work will be completed by September 30, 1994.

RURAL CENTER HIV/STD PREVENTION (IN)

Mr. DURBIN. Please provide a description of the program that has been funded under the Rural Center for HIV/STD Prevention in Indiana.

Dr. WILLIAMS. This program creates the Rural Center for the Study and Promotion of HIV/STD Prevention jointly between Indiana University, Bloomington, Indiana and Purdue University, West Lafayette, Indiana. The Center will be headquartered at Indiana University.

Mr. DURBIN. What is the national, regional, or local need for this program?

Dr. WILLIAMS. Many perceive that HIV/STD is only a problem in large urban areas. However, HIV/STD are found everywhere, including small towns and rural areas, suburbs, and large cities. HIV/STD are becoming increasingly serious in non-urban areas. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State existing formula funding and could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The purposes of the Rural Center for the Study and Promotion of HIV/STD Prevention are: the development and

evaluation of innovative educational material and approach designed to reduce HIV/STD risk behavior and incidence in rural areas, and the investigation of the social and behavioral barriers to HIV/STD prevention, the findings from which can be applied to the creation of prevention programming. This is the first year of funding for this program. Work was scheduled to begin on January 3, 1994. The fiscal year 1994 appropriation for this program is \$250,000.

Mr. DURBIN. What is the source of and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. The source of non-federal funds for this program is state of Indiana appropriated funds to Indiana University. The amount of non-federal funds for this fiscal year is \$145,406.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work will be carried out joint in the Department of Applied Health Science, Indiana University, Bloomington, Indiana and the Center for AIDS Research and the Department of Sociology, Purdue University, West Lafayette, Indiana.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. Since these projects are funded on an annual basis, we usually estimate the completion data for the end of the fiscal year.

RURAL ECONOMIC DEVELOPMENT THROUGH TOURISM (NEW MEXICO)

Mr. DURBIN. Please provide a description of the program that has been funded under the Rural Economic Development Through Tourism, REDTT, Project in New Mexico.

Dr. WILLIAMS. The REDTT Project is organized at the multi-county and county levels, with the Cooperative Extension Service (CES) of New Mexico State University providing significant leadership at both levels. Several training and planning meetings have been held in the eight-county region.

Mr. DURBIN. What is the national, regional or local need for this research?

Dr. WILLIAMS. This is a pilot project to create tourism training programs assisting in rural tourism development through training, capacity building and the implementation of a comprehensive tourism marketing strategic plan. Tourism development is a form of economic development of interest to rural areas such as the REDTT area in New Mexico. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. New Mexico Cooperative Extension was to spearhead a comprehensive program to assist rural communities and increasing tourism and economic development. Regional task force meetings composed of CES representatives and community leaders from business, industry, education, government at the federal, state and local levels have been held. REDTT products include a video, a public relations program, an image study, a regional tour-

ism map and guide for one county and a regional tourism bus package. The fifth issue of the project newsletter has been sent statewide to more than 1400 persons interested in rural tourism issues.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. In fiscal years 1992, 1993 and 1994, \$230,000 was appropriated each year for the project for a total of \$690,000. The first funds were approved April 17, 1992.

Mr. DURBIN. What is the source and amount on non-Federal funds provided by fiscal year?

Dr. WILLIAMS. In FY 1992, \$38,764 of state matching funds were provided. In FY 93 and 94, \$39,360 of these funds were provided.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. This work is being carried out in an eight-county area in Southeastern New Mexico which includes Chaves, DeBaca, Dona Ana, Eddy, Lea, Lincoln, Otero and Sierra counties.

Mr. DURBIN. When do you anticipate that work will be completed?

Dr. WILLIAMS. The work on the REDTT project should be completed March 31, 1995.

TECHNOLOGY TRANSFER PROJECTS (OK, MS)

Mr. DURBIN. Please provide a description of the program that has been funded under the Oklahoma and Mississippi Technology Transfer Projects.

Dr. WILLIAMS. The work plans involve the transfer of uncommercialized technologies from Federal laboratories and universities to rural businesses and communities. The programs are also involved with industrial extension efforts to transfer technology and provide training, and business management to small, rural manufacturing.

Mr. DURBIN. What is the national, regional or local need for this research?

Dr. WILLIAMS. Rural businesses in Oklahoma and Mississippi need access to state-of-the-art technology in order to remain competitive in world markets and to level the playing field vis a vis world competition from Japan, Germany, and others.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date.

Dr. WILLIAMS. The original goal was to tap technology from Federal labs in order to help solve US industry and local government problems.

Specifically, Mississippi Extension Service has demonstrated microcomputer technology and its applications to small town and rural county governments; has introduced new technologies associated with value added processing and marketing for small businesses and industries through the Food and Fiber Center; has demonstrated features of national databases and federal laboratory technology; and has extended cotton modeling programs developed by ARS.

Oklahoma State Extension Service has worked with rural businesses and industry groups as well as local governments to identify priority technology needs.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. I will provide a table of funding for the record.
[The information follows:]

FY 1984	\$350,000
FY 1985	350,000
FY 1986	335,000
FY 1987	333,000
FY 1988	333,000
FY 1989	333,000
FY 1990	330,000
FY 1991	331,000
FY 1992	331,000
FY 1993	331,000
FY 1994	331,000
Total	<u>\$3,688,000</u>

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. There are no non-Federal funds in these projects.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work is being carried out at Mississippi State University and at Oklahoma State University.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The work will be completed September 30, 1994.

RURAL DEVELOPMENT (OK)

Mr. DURBIN. Please provide a description of the program that has been funded under the Rural Enterprises Project.

Dr. WILLIAMS. This is a technology-based economic development program that seeks to promote job growth, business development, and rural entrepreneurship through business assistance, technical assistance, business incubators, and new business financing. Commercial product fairs are held each year showcasing inventions by entrepreneurs from rural areas.

Mr. DURBIN. What was the national, regional or local need for this research?

Dr. WILLIAMS. Small business in both urban and rural areas of Oklahoma require technical assistance to remain competitive in world markets in such areas as worker training, technology transfer, financial aid, and business management practices. In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The original goal was to assist rural business in Southeast Oklahoma to get access to technology, financial and business management assistance.

Thus far, Rural Enterprises has expanded the incubator service area, stimulated innovation through participation in the New Prod-

uct and Process Fair and other regional innovation fairs, assisted in plant expansion and improving competitiveness of existing small businesses and continued to develop linkages through extension at Oklahoma State University and Langston University, as well as already established linkages in the REI service area.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. I will provide a table for the record.

[The information follows:]

Fiscal year:	
1988	\$433,000
1989	433,000
1990	430,000
1991	431,000
1992	300,000
1993	300,000
1994	300,000
Total	2,627,000

Mr. DURBIN. What is the source and amount of non-Federal funds provided by fiscal year?

Dr. WILLIAMS. No non-Federal funds have been provided to this project.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work is being carried out at Rural Enterprises, Durant, Oklahoma.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The work will be completed on September 30, 1994.

PILOT TECHNOLOGY PROJECT (WI)

Mr. DURBIN. Please provide a description of the program that has been funded under the Wisconsin Pilot Technology Projects.

Dr. WILLIAMS. This project involves support for economic development in Wisconsin through direct assistance to manufacturers. The assistance takes the form of consultation to solve organizational, managerial, and technological problems through the application of improved technology.

Mr. DURBIN. What is the national, regional or local need for this research?

Dr. WILLIAMS. This project provides services within the State of Wisconsin. In view of significant needs for extension efforts in high priority National interest topics such as improve pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of this program and what has been accomplished to date?

Dr. WILLIAMS. The goal from the outset has been to help small and medium sized manufacturers in Wisconsin become more competitive, productive and profitable.

UW-Stout has overall responsibility for the Northwestern manufacturing outreach center program of work, staff and fiscal manage-

ment. Stout conducts preassessments, plans technical seminars, and directs and coordinates the activities of project managers who conduct in-plant extension activities. All staff are involved in activities such as: Perform preliminary assessments, and serve as proactive brokers of services available through the state's technical colleges, university system, private institutions of higher education, private consultants, federal laboratories and NIST Manufacturing Technology Centers. Center staff do not duplicate the assistance available through campus outreach efforts such as the Wisconsin Innovation Center, UW-Engineering Professional Development, or technical colleges education, training, technical assistance contracting. Instead the manufacturing outreach center administrative staff actively seeks to match the needs of manufacturers with existing expertise; work with CES and Technical Colleges to identify appropriate staff to participate in industrial assessments and in-plant extension projects; organize training for faculty and staff from the CES, technical colleges and Stout's campus to improve their skills in functioning as assessment team members and project managers; and provide technical information to manufacturers and offer experienced referral assistance.

Mr. DURBIN. How long has this work been underway and how much has been appropriated by fiscal year through fiscal year 1994?

Dr. WILLIAMS. This project has been underway since FY 1992 and was funded for \$165,000 in FY 1992, FY 1993, and FY 1994 for a total of \$495,000.

Mr. DURBIN. What is the source and amount of non-federal funds provided by fiscal year?

Dr. WILLIAMS. No non-federal funds have been provided to this project.

Mr. DURBIN. Where is this work being carried out?

Dr. WILLIAMS. The work is being carried out at the University of Wisconsin-Stout.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The work will be completed on September 30, 1994.

DELTA TEACHERS ACADEMY

Mr. DURBIN. Please provide a description of the program that has been funded under the Delta Teachers Academy project.

Dr. WILLIAMS. Initially funded in FY 1994, the Delta Teachers Academy project is providing approximately 375 teachers at 25 sites throughout the seven Lower Mississippi Delta States with development opportunities by teaming them with university scholars in on-site sessions and residential summer institutes. The subjects focused on during these training opportunities are English; geography, history, mathematics and science.

Mr. DURBIN. What is the national, regional, or local need for this project?

Dr. WILLIAMS. The Delta Development Commission report to Congress in 1990 stressed the severe educational needs of teachers in the Lower Mississippi Delta Region. It cited poor student performance, one of the highest illiteracy rates in the country, and de-

moralized teachers who had little or no opportunity for substantive academic development.

In view of significant needs for extension efforts in high priority National interest topics such as improved pest management systems, funds are not proposed to continue this program. At the discretion of the State, existing formula funding could be redirected to support this program.

Mr. DURBIN. What was the original goal of the program and what has been accomplished to date?

Dr. WILLIAMS. The original goal of the project remains to provide academic and professional development for elementary and secondary teachers in the seven-state region of the Lower Mississippi. Prior to being funded within the Extension Service appropriation, the Delta Teachers Academy, using resources from other Federal and non-Federal sources, offered intensive educational development activities for 100 teachers from more than 50 rural school districts at 10 sites across the seven states.

Mr. DURBIN. You say that prior to being funded by Extension the Academy used funds from other Federal and non-Federal sources. How long has this initiative been ongoing? What was the funding level prior to fiscal year 1994? Where did this funding come from? Is the Academy still receiving these funds?

Dr. WILLIAMS. The Delta Teachers Academy began in 1991 with a grant from the Department of Education in the amount of \$500,000. Those funds were used to establish an academy site at ten locations in the Mississippi Delta Region. Other funds have included \$150,000 from the BellSouth Foundation, \$72,000 from the Winthrop Rockefeller Foundation and donations from Texas Instruments valued at \$10,000. In 1994, the Academy will receive \$50,000 from the BellSouth Foundation and \$37,000 from the Winthrop Rockefeller Foundation.

Mr. DURBIN. Where is the work being carried out?

Dr. WILLIAMS. The project will be conducted at 25 sites to be selected within the seven state Lower Mississippi Delta region.

Mr. DURBIN. When do you anticipate that the work will be completed?

Dr. WILLIAMS. The development opportunities and training for the 375 teachers anticipated for this project, will be conducted and completed during 1994.

RURAL DEVELOPMENT—NEBRASKA

Mr. DURBIN. Provide the Committee with an analysis of the rural development project in Nebraska that was completed in September 1993.

Dr. WILLIAMS. That project had been operating since October, 1978, and Federal appropriations began in 1988 and went through 1993, totaling, \$1,740 million. The goals reached through this program were: Stimulating the development of new food processing industries; assist existing firms to become more competitive; assist new and existing firms through educational programs developed for management and employees; and help commodity groups and State agencies in developing value-added export markets.

FEDERAL ADMINISTRATION

Mr. DURBIN. Would you please update both tables that appear on page 330 of last year's hearing record, showing the breakout for Federal Administration expenses, to reflect fiscal year 1993 actuals?

Dr. WILLIAMS. I would be happy to update those tables for the record.

[The information follows:]

Extension service sources of Federal administration

[Dollars in thousands]

Program:	1993
Smith-Lever 3(b and c)	6,668
1890's and Tuskegee University	989
D.C. extension	40
1890 facilities	320
Federal administration, (direct)	5,400
Other program set-asides	3,318
Total	16,735

Extension service object classification

[Dollars in thousands]

Object class:	1993
Personnel compensation:	
Salaries	10,488
Benefits	2,295
Subtotal	12,783
Other object classes:	
Travel	917
Transportation of things	47
Communications, utilities, and other rent	753
Printing	415
Other services	1,495
Supplies and materials	336
Equipment	319
Grants, subsidies and contributions	411,821
Total	428,887

CONTRACTS/GRANTS

Mr. DURBIN. Were any grants or contracts issued by Extension out of your discretionary funds in fiscal year 1993 or to date for fiscal year 1994?

Dr. WILLIAMS. Yes. During FY 1993 there were approximately ten grants or projects funded from our discretionary fund. In FY 1994, so far we are funding two special projects from our discretionary funds; a Department of Defense Reinvention Project for \$50,000, and the National Coalition For Advance Manufacturing Project for \$14,000, which is a project that assesses the potential collaboration between CES and Industrial Extension programs.

4-H ENROLLMENT

Mr. DURBIN. Please update the table that appears on page 331 of last year's hearing record, showing both rural and urban 4-H enrollment, to include fiscal year 1993 actuals and fiscal year 1994 estimates.

Dr. WILLIAMS. 4-H enrollments in total peaked in 1991, and have shown slight declines annually since then. Currently, 48.3 percent of participants are from rural areas, and 51.7 percent from urban areas. While state enrollment summaries for FY '94 will not be sent to us until this coming November, we would predict continuing slight decreases in both rural and urban participants. We believe these declines are due to the continuing reduction in cooperative extension 4-H staff in county offices.

[The information follows:]

National 4-H Enrollment by Residence

Year	Rural	Urban	Total
1988	2,475,249	2,421,968	4,892,217
1989	2,680,584	2,464,964	5,145,548
1990	2,710,612	2,723,674	5,434,286
1991	2,763,652	2,894,005	5,657,657
1992	2,671,389	2,972,996	5,644,385
1993	2,645,819	2,833,007	5,478,826

AGENCY BUDGET REQUEST

Mr. DURBIN. Provide a complete breakout of your request to the Secretary, the Secretary's request to OMB, and the OMB allowance.

Dr. WILLIAMS. I will provide this information for the record.

[The information follows:]

FY 1995 BUDGET REQUESTS
Dollars in Thousands

PROGRAM	AGENCY REQUEST	DEPARTMENT ALLOWANCE	1995 PRES. BUDGET
Smith-Lever 3b&c	\$279,043	\$271,557	\$271,557
1890's and Tuskegee University	32,694	25,472	25,472
D.C. Extension	1,073	1,025	1,025
Smith-Lever 3d:			
Pest Management	11,394	10,459	10,459
Rural Development	5,938	950	950
Water Quality	16,234	11,234	11,234
Pest. Applicator Training	4,500	2,000	2,000
Youth and Families at Risk	14,851	10,000	10,000
EFNEP	66,992	61,431	61,431
Pesticide Impact Assessment	3,363	3,363	3,363
Urban Gardening	0	0	0
Food Safety	3,975	2,975	2,975
Farm Safety	988	988	988
Indian Reservation Ext. Agents	1,750	1,750	1,750
Nutrition Education Initiative	4,265	4,265	4,265
Sustainable Agriculture	11,461	4,963	4,963
Comm/High Technology Appl.	2,000	0	0
Ag Telecommunications	3,206	1,221	1,221
RREA	8,715	3,341	3,341
Disadvantage Farmer Asst. Prg.	0	0	0
Rural Technology Grants	0	0	0
Rural Health and Safety	6,375	2,000	2,250
Socially Disadv. Farmers	0	0	0
1890 Facilities (Sec. 1447)	7,901	7,901	7,901
Federal Administration:	6,041	5,606	5,296
Total	492,759	432,501	432,441

FEDERAL BUILDING FUND

Mr. DURBIN. You receive a reimbursement from the Federal Building Fund. What is this for?

Dr. WILLIAMS. Several of the State Extension Services have county offices which are located in federally-owned buildings. GSA charges ES-USDA for this space and we receive reimbursement from our State partner.

Mr. DURBIN. Thank you. Mr. Skeen.

Mr. SKEEN. Thank you, Mr. Chairman, and Dr. Williams, I want to begin by saying that I'm probably one of the few persons in the Congress of the United States that has had any real experience with the extension personnel.

Let me tell you, there isn't a greater bunch of people anywhere in the world than those folks that are county agents, home demonstration agents, extension specialists and all the rest. I can attest to it because they have held my hand for some 30 years through the process, and they are the greatest linkage between the advancement of research that's done in agriculture, and applying that research to the actual field level work that goes on.

Dr. WILLIAMS. Thank you very much.

Mr. SKEEN. During that process, I think we improved the production of our particular unit of agriculture by some 100, 150 percent.

Let me share with you just a little story. You know, your history goes back I think to the beginning of the Extension Service, somewhere in the depression era, in the 30's.

We had a young lady that was an early home demonstration agent, a young lady from your part of the country, Louisiana, who came to New Mexico as a home demonstration agent.

She said one of the worst experiences she had was talking to a family of very limited means on nutrition. They had a very large family. They had about 12 children. In the process, they were explaining how you use the basic foods. In our part of the country, it's chile, beans, and so forth, and there isn't a better balanced diet in the world, according to us. [Laughter.]

Another part of her training and responsibility was also to talk about planned parenthood. Well, she got through the dissertation on the food and nutrition part of the program, and then she said I want to talk to you about family planning, birth control.

She explained some of the processes and things. The lady she was talking to burst into tears and said I can't understand it. She said we're having enough trouble feeding these youngsters, now you want to take our only form of enjoyment away from us. [Laughter.]

You folks have come a long way and you've gone through an awful lot. We appreciate it, and I know that this business of the drawdown in personnel is going to be a re-adjustment, from not just the Extension side of it, but also the county agent. It takes real dedicated people to do it, and they're not paid handsomely.

One of my colleagues asked me, where do you live. I said well, I live about—I gave the distance between two cities in New Mexico, and I said I'm really a rancher so I'm 17 miles off a paved road, and this fellow was from Vermont and is now a U.S. Senator.

He said there ain't no place in the United States that is 17 miles off a paved road, and I said yes, there is. And I will tell you one thing, every Extension agent and every county agent knows exactly where all those folks are, because they work with them day-in and day-out. It's a tremendous service.

I don't know how you're going to do your drawdown and so forth, but I hope it is on a criteria that really does not preclude us having that attachment between basic agricultural production, and the persons who will come by when you are rounding up at 4:00 and 5:00 o'clock in the morning. They are out there and they've had to drive 200 miles to get to you, so I really appreciate it.

Let me ask you on this pesticide program, I'm a little concerned about that because it applies to a lot of the field agricultural, but not too much in the way of livestock operations. I don't know how you're going to comply with these new regulation governing farm workers safe standards.

Would you explain how you plan to help the EPA in enforcement? Is the Extension Service going to play a part in this?

EXTENSION/EPA COOPERATION

Dr. WILLIAMS. We will play a part in it. We are discussing it with the EPA and the possibility of using some funds for helping to train the people at the state levels.

That will be handled state-by-state, but we definitely will be involved in it.

Mr. SKEEN. But get the information because I think everyone wants to practice safe use of chemicals. DDT was one of the best examples I know of. We banned DDT and there was no real scientific basis for doing it, and so now we lose a lot of people from various kinds of fevers that could have been totally eliminated if we had maintained the use of DDT.

Dr. WILLIAMS. What people forget often is that farmers especially are environmentalists.

Mr. SKEEN. They are primary environmentalists.

Dr. WILLIAMS. They don't want to do anything to destroy what is taking place there because they don't plan on going anywhere the following years. It is not a thing of fouling up their surroundings, and taking off going to new surroundings. They expect to be there, and expect their offspring to be there, so it is their effort to keep it safe.

So they do take a bum rap sometimes on what they are doing.

Mr. SKEEN. The Extension Service has played a very important part because they are disseminators of information, and also practitioners of the art of how do you use it, how do you apply it.

The old story used to be years ago before the 30's, that every farmer that had a child would say, if they got to be 20 years old, son, I have worn out more farms than you are years old.

We don't want to wear out those farms.

We want to keep them in business, and I think that's basic, but then your kind of work is to provide that linkage. It's all right to have all the research in the world, but it doesn't do you a doggone bit of good unless there is somebody to show you how to apply it, and really make it work.

And you folks have done it, and have done a marvelous job. We really appreciate it.

Dr. WILLIAMS. Thank you very much.

Mr. SKEEN. I don't know how you're going to handle this thing, but we're going to watch it closely when you begin selecting how you do the drawdown, where you remove agents, where you lose offices, I hope it is done with a good criterion, and with the idea that we're going to try to give the best service possible under the circumstances.

Dr. WILLIAMS. Thank you, sir.

Mr. SKEEN. Thank you. Thank you, Mr. Chairman.

Mr. DURBIN. Thank you, Mr. Skeen. Ms. Kaptur.

Ms. KAPTUR. Dr. Williams, welcome.

Dr. WILLIAMS. Thank you very much.

PROGRAM PRIORITIES

Ms. KAPTUR. Gentlemen, welcome this morning. I come from the northwestern part of Ohio, located on the Great Lakes, and I have had marvelous help from our Extension Service in the counties that I represent.

When the Chairman asked Dr. Williams what your mission was, and you answered education, that's a pretty broad mission. I am curious as to how, with the limited budget, and all the priorities that are out there in different parts of the country, how do you deal with changing priorities?

If I were to ask you what are the priorities of extension in Ohio or in the Midwest today, how would you even attempt to answer that question?

Dr. WILLIAMS. Extension is constantly changing. In attempting to answer the Chairman there about the number of people we had in agriculture at the beginning of the Extension, and the number we have now. We have less than three percent of our population in agriculture production, and yet we are able to feed ourselves and much of the world. Whereas in some countries, you have 80 percent of the people involved in agriculture production, yet they cannot produce enough for their own people to survive.

So it is just a matter of how the Extension has been changing, because that many farmers, that many producers left farming is not bad. Extension, research and some of the things that we got people to put into practice, freed up other people to do other things.

It can be put in terms of evaluation.

A district agent went out to evaluate a staff. Each year the number of clubs, the number of persons that were reached everything, seemed to have been on a constant decline.

The thought was that there should be some changes in the efforts and attempts to reach people, that something different had to be done.

The people had changed. They just were not the same anymore. They didn't want what was offered, The District Agent used the analogy of a very successful buggy-making business during the year the T-Model Ford was invented. Suddenly nobody wants to buy the buggy anymore, what are you going to do?

Are you going to continue to make the buggy and not sell them, or are you going to start making parts for the T-Model Ford?

This is a way of saying that the program needed to change. This is what we do all the time in Extension—evaluate and change. Resources last year, were shifted greatly to help meet the needs of people because the priorities changed due to the disaster situations. We're doing this constantly, and we involve our people.

What is so unique about Extension, is that you have programs that have national impact like water quality and integrated pest management and that should be looked at, at a national level. But there are things that effect local needs, and we have Extension people, and our clientele involved in designing programs at the local level.

Extension is not a program that goes from the top to bottom. The users of the program are identifying problems along with the extension agents that Mr. Skeen mentioned, along with advisory committees.

This is how the Extension priorities are developed, at the local level to meet the needs of the people.

BASE PROGRAMS/NATIONAL INITIATIVES

Ms. KAPTUR. Well, this is what I wanted to understand from you because I look at the various counties that I represent, and the Extension agents are always there to answer questions on everything from how do you get rid of Japanese beetles, to how do you prune a fruit tree. What type of mandate from the state or the Federal Government, whether it is sustainable agriculture, whether it is integrated pest management, whatever it might be, do the agents have? Is there a broader mission that also allows for some local initiatives?

What is the mix between those two?

Dr. WILLIAMS. There are things, as I mentioned, that are cross-cutting for all states on some of the national programs, but the primary programs of extension are local.

Ms. KAPTUR. Yes. I guess if I look at the area that—

Dr. WILLIAMS. I think Dr. Geasler wanted to add something here.

Dr. GEASLER. Dr. Williams makes a valid point relative to the local needs and programs generated by local people. The system also has an extensive program of strategic planning and building those local programs to the state level, and then to the national level.

And over the past few years, that process has defined a set of base programs which define Extension. They are very general. They are broad in scope. They are the program that we expect in every office.

Ms. KAPTUR. What are those?

Dr. GEASLER. We don't mandate those, but we expect these areas to be addressed.

Ms. KAPTUR. Every office has something going in this area.

Dr. GEASLER. Yes. They are the base program. They are central to our mission, and we don't tell them they have to program in those, but they are the basics of what we do.

Then we have gone beyond that and identified a set of what we call national initiatives. These are targeted, focused, and have a set of objectives and measurable outcomes that we hope to impact a specific issue in a period of time.

They are not things that we expect to go on for time eternal. They are focused. We hope to make a difference, and move on with educational programs related to other issues that are incumbent in that set of base programs.

We don't mandate that every state or every county office program in those national initiatives. Communities in economic transition is not that big an issue in Connecticut, but in Iowa or Montana, it's a greater issue.

Youth at risk, however, is an issue in about every county in the nation.

Ms. KAPTUR. Is it possible, sir, for you to submit for the record the information that you are summarizing now with a little more specificity?

Dr. GEASLER. We certainly can, and we can give you details on the amount of program that takes place, the volume of program planned in those base programs and national initiatives.

[The information follows:]



EDUCATIONAL BASE PROGRAMS

Base Programs are the major educational efforts central to the mission of the System and common to most Extension units. The base programs are the ongoing priority program efforts of the System, involving many discipline-based and multidisciplinary programs. They can be thought of as the foundation of a building, while the National Initiatives rise from the base to receive special emphasis for a period of time. Following are the educational base programs as approved by the Extension Committee on Organization and Policy (ECOP) and ES-USDA.

AGRICULTURAL COMPETITIVENESS AND PROFITABILITY

Educational programs emphasize systems approaches that maintain and enhance profitability through the application of sound crop and animal production practices. Farm business management, marketing, decisionmaking skills, and environmental considerations are the focus. These problem-oriented programs transfer latest proven technologies to clientele and promote optimum use of resources consistent with environmental and family goals.

COMMUNITY RESOURCE AND ECONOMIC DEVELOPMENT

Educational programs target development of all community resources, emphasizing economic viability. The focus is to teach comprehensive community economic analysis to help communities create strategies to strengthen existing employers, attract new enterprises, and encourage local entrepreneurship. To increase community vitality and aid socioeconomic transitions, programs include community services and facilities, housing, and human development through leadership and public policy awareness.

FAMILY DEVELOPMENT AND RESOURCE MANAGEMENT

Educational programs help individuals and families develop the competencies to become healthy, productive, financially secure, environmentally responsible members of society. Education is targeted to management of resources—including money, time, apparel, housing, and energy; strengthening individual and family relationships; providing quality care for children; and maximizing independence of the elderly.

4-H AND YOUTH DEVELOPMENT

Educational programs focus on building lifelong learning skills that develop youth potential. This extensive set of programs is designed to engage youth in healthy learning experiences, increasing self-esteem and problem-solving skills. Programs address stress management, self-protection, parent-teen communication, personal development, careers, outreach and interchange, and global understanding. A wide range of content offerings encourage youth to explore science, technology, and citizenship.

LEADERSHIP AND VOLUNTEER DEVELOPMENT

Educational programs emphasize developing life skills, especially leadership. Leadership and volunteer programs empower participants to improve their self-esteem and life skills and strengthen the communities in which they work and live. Volunteers multiply program impacts, expand public policy education, and improve community organization and leadership.

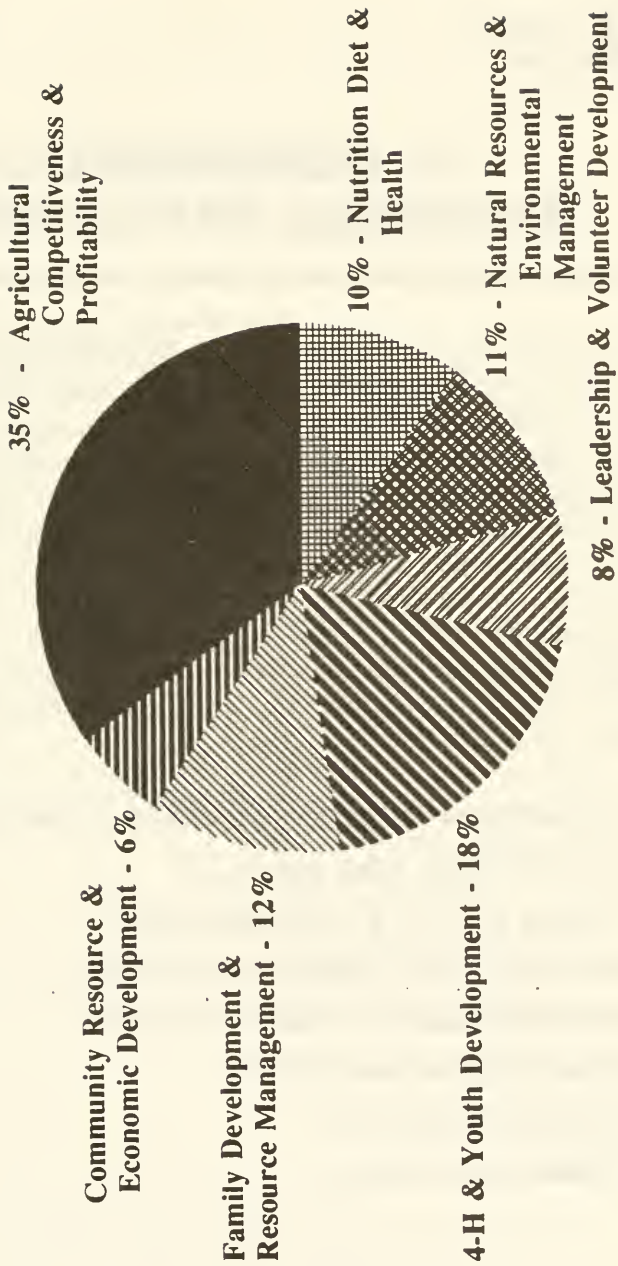
NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

Educational programs focus on management, use, and sustainability of natural resources with special attention to environmental stewardship and biodiversity. Programs encompass soil, water, air, and plant management; fish and wildlife management, aquaculture, conservation, and forestry; sustainable use and management of rangelands, wetlands, and wildlands; land use planning; and use of information systems.

NUTRITION, DIET AND HEALTH

Educational programs provide individuals and families with a knowledge base to make informed decisions about food, nutrition and health. Objectives include helping people achieve and maintain optimum weight and reduce the risk of chronic disease; give birth to healthy babies; practice responsible and healthy self-care; help children attain optimum long-term health; minimize nutritional inadequacies and abuses in foods; and improve consumers' ability to make informed choices related to food safety, quality, and composition. Programs are shaped by the Nation's dramatic changes in family structure and lifestyle and are targeted for the nutritionally vulnerable. The Expanded Food and Nutrition Education Program (EFNEP) is an example of a program that reaches out to achieve these objectives with low-income families with young children.

Allocation of Professional FTEs Among Base Programs





CURRENT NATIONAL INITIATIVES

National Initiatives are the Cooperative Extension System's commitment to respond to important societal problems of broad national concern with additional resources and significantly increased effort to achieve a major impact on national priorities. They are the current most significant and complex issues for which the Extension System has the potential to make a difference. National Initiatives rise from the base programs to receive special emphasis for a relatively short time. Following are the National Initiatives as approved by the Extension Committee on Organization and Policy and Extension Service, U.S. Department of Agriculture, October 1992.

- **COMMUNITIES IN ECONOMIC TRANSITION**
- **DECISIONS FOR HEALTH**
- **FOOD SAFETY AND QUALITY**
- **PLIGHT OF YOUNG CHILDREN**
- **SUSTAINABLE AGRICULTURE**
- **WASTE MANAGEMENT**
- **WATER QUALITY**
- **YOUTH AT RISK**



COMMUNITIES IN ECONOMIC TRANSITION

WHY AN AGENDA FOR COMMUNITIES IN ECONOMIC TRANSITION?

Many small communities, as well as urban centers, face an impending economic crisis because of deteriorating infrastructures, declining employment, and the reduced earning capacity of families living in these areas. From early 1990 to 1991, rural communities lost over 200,000 manufacturing jobs. The availability of off-farm employment is another critical issue facing small and rural communities in that overall, farmers receive 60 percent of their income from off-farm sources. The economic viability of counties is yet another concern.

STATUS AND ACCOMPLISHMENTS

In response to the economic crisis affecting many small communities and urban neighborhoods, the Cooperative Extension System--through the Extension Committee on Organization and Policy--named Communities in Economic Transition as an Extension National Initiative in October 1992. The Initiative focuses on strategic economic development, enterprise development, and business assistance for small and rural communities.

As part of enterprise development and business assistance, Extension will help local leaders increase profitability and competitiveness by:

- providing training opportunities for small business owners.
- providing technical support to business firms via EXPERT teams (see below).
- assisting small and rural communities in enterprise development.
- providing global marketing assistance to firms.
- providing for innovation and creativity in economic diversification among small and rural communities.

As part of strategic planning for economic development, Extension will

- assist community leaders in identifying effective economic development strategies;
- work with small and rural community leaders to develop strategic plans for economic development.
- provide reports, data interpretation, trend analysis, and strategy insights to local leaders; and
- provide leadership in local issues resolution by collaborating and cooperating with federal and state agencies and organizations.

The Cooperative Extension System is already making significant progress in developing model educational programs aimed at revitalizing rural areas and improving the economy in rural communities through such efforts as:

- The **OuR-TOWN Rural Vacation Marketing System**—a computerized, user-friendly database of rural vacation attractions and destinations to help communities develop tourism as a new industry.

- **EXPERT Teams**—a regional support team of issue experts who work with state specialists, area agents, and county-level staff to provide technical support within targeted areas. Targeted areas include tourism, retail, small manufacturing, entrepreneurship, home industries, and value-added opportunities for natural resource-based commodities. Strategic planning, community economic analysis, management, and marketing training are critical elements.
- **President's Initiative on Rural Development**—part of a government initiative to promote cooperation and collaboration among federal agencies. Extension staff developed and implemented a test program to bring USDA agencies with rural development programs together to form working partnerships.
- **Going Global**—uses a computerized international trade-lead network and educational programs to assist small and medium-size rural businesses understand and enter new international and domestic trade markets. In its third year, **Going Global** has helped rural businesses export products to Japan, Europe, and Mexico.



DECISIONS FOR HEALTH

WHY AN AGENDA FOR HEALTH?

Health care is the number one concern of a large segment of Americans. Even some individuals with health insurance coverage are finding medical care unaffordable. With the aging of the U.S. population and the high cost of advances in medical technology, American health care costs, as well as the cost of health insurance coverage, are likely to continue to escalate. The cost of medical care and the national debate on various health-care reform proposals have made this topic a leading public policy issue.

Those most likely to be uninsured are the poor and near-poor—a classification comprised of disproportionate numbers of the young, the old, women, and minorities. Their lack of sufficient access to affordable health care means fewer opportunities for prevention or early detection of disease, and therefore more expensive care at a later stage. Across rural America, families are confronted with isolation and gaps in rural service delivery systems, including a dearth of professional expertise in how persons with disabilities can be accommodated.

STATUS AND ACCOMPLISHMENTS

The Cooperative Extension System (CES) is moving quickly to meet the health and health care needs of the American public by empowering individuals and communities to decide rationally and systematically how best to meet their health and health care needs. To accomplish this, the CES established the Decisions For Health National Initiative.

Three focus areas were selected for immediate attention: education about health-care reform issues; early childhood immunization; and community capacity building through strategic planning and communication networks.

An issues education package was developed on various proposed health-care reform options to help the layperson understand the implications of each. The package includes an analysis of the most frequently considered options in terms of type of coverage, type of payment, taxes, cost containment, quality of care, unresolved issues and other areas. The potential impact of health-care reform on rural people and communities is emphasized.

The Initiative Team is continuing its partnership with Department of Health and Human Services, representatives from the Centers for Disease Control, the Bureau of Primary Health Care, and the Office of Rural Health Policy to facilitate the immunization of American children. Other federal and private-sector partnerships will be developed.

The Team is holding strategy sessions to enable the CES to work effectively with communities throughout the United States on such matters as assessing health and health care needs and planning strategically to meet these needs. The Team plans to use CES telecommunications to develop and implement a national community support network. Participating communities will then be able to access and share information with one another, learn from one another, and share

emotional support as they work to meet the health and health care needs of their citizens.

GOALS

The Decisions For Health Initiative will empower people to practice healthy life styles; empower individuals and communities to make decisions that enhance accessibility to, and availability of, existing health care resources; build community capacity to systematically assess needs for health and health care services and facilities; and develop strategies to meet identified needs. Three goals will be emphasized:

Goal 1: Personal Decisions for Health

People will adopt healthy lifestyles by reducing high-risk behaviors and taking responsibility for health decisions.

Goal 2. Personal and Organizational Decisions for Access and Affordability

Individuals and community organizations, in making informed decisions, will improve access to, and affordability of, health care.

Goal 3. Community Decisions for Health

Communities will improve their capacity to analyze health and health-related infrastructure needs and to take appropriate action.

TARGET AUDIENCES

Health care is critically important to everyone. Limited resources—human and financial—dictate that the Cooperative Extension System identify specific audiences for health programs:

- people with limited resources, both rural and urban
- farm operators, agricultural workers, and their families
- communities with limited resources

The Cooperative Extension System will also form partnerships with health care providers, other local community organizations, and public and private-sector cooperators as it works to improve individual, family, and community health.



Cooperative
Extension
System

FOOD SAFETY AND QUALITY

WHY AN AGENDA FOR FOOD SAFETY AND QUALITY?

Americans are buying more precooked and partially precooked refrigerated foods, and with this trend comes increased potential for illness from food mishandling. Food-borne illness is a major cause of death in the United States. Some people are especially vulnerable—the elderly, the very young, and the chronically ill. At the same time, more people are eating in public places where safe food handling may not be practiced. Diverse ethnic food handling and preparation practices have also contributed to a rise in food-borne illness. Massive numbers of foodservice employees need education in proper food handling procedures.

Food safety before harvest is also important because practices and systems employed in food production can reduce the risk of food contamination. Hazard Analysis and Critical Control Point (HACCP) systems have as their goal safe, high-quality products through control of all high-risk steps in the food production operation. Public distrust of the regulatory system and concern over pesticides and drug residues in food are growing, and Americans are requesting accurate information about how to manage and minimize contamination risks.

Extension's Food Safety and Quality National Initiative focuses on improving the ability of people throughout the food system to make informed, responsible decisions about food safety and quality issues. The CES can draw on the expertise of community-based Extension professionals nationwide to educate Americans about food safety and quality issues.

STATUS AND ACCOMPLISHMENTS

Ensuring and communicating food safety requires innovative educational approaches such as those currently in use by the Cooperative Extension System nationwide. Several model programs aimed at educating particular segments of the public and food production personnel are underway.

Since Fiscal Year 1991, the federal government has provided \$1.5 million in annual funds to support Extension's Food Safety and Quality Initiative. As a result, Extension has created model programs nationwide in four target areas: improving understanding of the scientific and policy bases of risk management for youth, adults, and the media; enhanced use of the Food Animal Residue Avoidance Databank, creating HACCP models and training materials; and decreasing the risk of food-borne illness for vulnerable individuals.

The development and implementation of model educational programs for institutional and commercial foodservice workers, small-scale entrepreneurs, and red-meat processors are completed. Materials and project reports are being distributed nationwide to facilitate dissemination of the programs. A database of reviewed food-safety curricula soon will be made available to educators to aid them in risk communication programming.

Another Initiative accomplishment is the *Residue Avoidance: Evaluation of the Dairy Quality Assurance Program and the Approach to Total Quality Management*, a model dairy quality assurance program designed for use nationwide to protect the milk supply. In this project, Extension experts, including veterinary and dairy science specialists, are linked with veterinary dairy clinicians from the Food Animal Medicine Production Consortium, the National Milk Producers Federation, Agri-Education, and the American Veterinary Medical Association.

Food Safety in Foodservice: A Public Policy Program, an educational program developed and conducted by Kansas State University Extension faculty, explores ways to protect the health of people who eat food purchased away from home. At Penn State University, Extension professionals developed a videotape, "Learn Your Food Safety I.Q." and an educational module for child care providers to use in reducing the risk of food-borne illness.

A Montana State University Extension program, *Project Food Safety*, involves youth in hands-on and critical thinking activities related to microbial contamination of food, pesticides and food, and food irradiation. Activities are designed to help youth make informed decisions about the risks and benefits of the foods they eat.



PLIGHT OF YOUNG CHILDREN

WHY AN AGENDA FOR YOUNG CHILDREN?

The number of children in poverty increased by more than 3 million during the 1980's. By 1990, more than 13 million American children—nearly 2 in 5—were poor. Particularly affected are those aged prenatal to 5 years. Too young to determine their own destinies, children must rely on the security provided by their families and communities. All too often, however, their families fall victim to the overwhelming conditions of today's world.

The Cooperative Extension System (CES) is concerned about this critical societal problem. Using a comprehensive program approach, and drawing on the expertise of community-based Extension professionals, the CES is expanding its current outreach to children from prenatal stage to 5 years of age and their families. Collaboration with other community-based organizations is a critical component of this work.

STATUS AND ACCOMPLISHMENTS

Extension's objectives under its new Plight of Young Children National Initiative are to:

- build on successful paraprofessional models that support families and children and that provide them services.
- provide access to comprehensive education for limited-resource families; and
- improve families' skills in nutrition, money management, and parenting.

Expected outcomes for families are: reduced infant mortality; increased opportunity for each infant to reach its first birthday healthy and well-nourished; improved education programs that better address early childhood development, thereby ensuring that all children enter school healthy and ready to learn; increased control over personal finances; and the strengthening of successful paraprofessional models that deliver comprehensive programs targeted to individuals and families, in support of children.

Extension staff nationwide are involved in programs addressing these issues such as:

Promoting Healthy Babies

Indiana's "Have a Healthy Baby" program, New Jersey's "Great Beginnings," in Alabama's "Today's Mom," and Kentucky's "Partner-Assisted Learning" have reduced infant mortality, decreased the incidence of low birth-weight babies, and improved parenting and money management skills in new parents, especially high-risk teen parents.

Increasing Community-Based Cooperation

State Extension professionals have worked closely with a variety of agencies and organizations throughout the Nation to achieve mutual goals related to

child and family well-being. Successful collaboration has occurred with the March of Dimes, Women, Infants, and Children (WIC), Healthy Mothers, the Healthy Babies Coalition, the National Center for Education in Maternal and Child Health, Well-Baby clinics and schools, public health departments, consumer credit organizations, the Internal Revenue Service, child abuse and neglect prevention organizations, family courts (custody and juvenile programs), Catholic Charities, community mental health programs, youth services, women's crisis centers, public schools, and many others.

Impact of Programs

Targeted programs increased incidence of babies born at a healthy birth weight nationwide. In addition, parents improved their parenting skills and regained custody of their children in many court-ordered and voluntary education programs.

The Expanded Food and Nutrition Education Program, which reaches more than 700,000 families and youth each year, continues to train low-income families to stretch their food dollars and to provide their children good nourishment.

As a result of money management education, many families also improved their financial situations. In Illinois, more than 15,000 homemakers enrolled in money management courses collected refunds ranging from \$2 to \$8,610 and totaling more than \$10.5 million. Approximately 65 percent of these participants have annual incomes of less than \$6,000. Many families also received Earned Income Tax credits.



SUSTAINABLE AGRICULTURE

WHY AN AGENDA FOR SUSTAINABLE AGRICULTURE?

Americans nationwide are becoming increasingly concerned about social and environmental farm issues such as food safety and quality, surface and ground water contamination, biotechnology applications, and natural resource management. Soil erosion, increased international competition, and changing consumer preferences are also contributing to the need for a more balanced and sustainable American agricultural system.

In response, Congress authorized the development of research and education programs promoting sustainable agriculture systems and practices and has charged the Extension Service-USDA to take the leading educational role in facilitating the development of these site-specific, whole-farm systems.

STATUS AND ACCOMPLISHMENTS

Extension staff nationwide are developing information, education, and demonstration programs that promote economically sound, socially acceptable, and environmentally friendly agricultural practices.

These efforts include:

- developing human and data networks that enhance the transfer of practical, reliable, and timely information to farmers and ranchers;
- analyzing and evaluating technologies with promise for the development of globally competitive, environmentally sound agricultural systems;
- validating research demonstrations that illustrate the effectiveness of sustainable methods and practices in whole-farm systems;
- providing technical training for Extension and other professionals involved in developing sustainable agriculture systems; and
- disseminating appropriate technical guides and/or other educational materials that promote the practical application of sustainable whole-farm systems.

The Sustainable Agriculture Research and Education (SARE) program of the Food, Agriculture, Conservation, and Trade (FACT) Act of 1990 (Subtitle B of Title 16), mandates sustainable agriculture programs. Examples of such programs include the following:

- PLANETOR, a computer program operating in 17 states, provides producers and ranchers with the economic and environmental data essential for making informed decisions about farm operations.
- SAREP, the Sustainable Agriculture Research and Education Program, is actively involved in a wide range of research projects throughout the University of California (UC) Extension system. SAREP staff created a database on sustainable agriculture in California and cosponsored six commodity-specific and eight general conferences on sustainable agriculture topics.

- The Cornell Extension Farming Alternatives Program, a 2-year program funded through USDA, conducts research on organic and sustainable farming practices in New York. Expected results include a production manual, inservice training sessions, and farm-field days in which farmers receive demonstrations of sustainable agriculture practices.

Nationwide, through workshops, conferences, and demonstrations, the Cooperative Extension System (CES) is providing training and incentives that promote interdisciplinary teamwork in sustainable agriculture. The CES also is conducting new types of cost-benefit assessments for farmers and ranchers; promoting public policy education; and working with the Cooperative State Research Service (CSRS) to implement portions of the Sustainable Agriculture Program authorized under the 1990 Farm Bill.



WASTE MANAGEMENT

WHY AN AGENDA FOR WASTE MANAGEMENT?

Growing public concern over environmental quality, together with increasing regulatory requirements for safe waste disposal, have created an urgent need for waste management education in the United States.

As a result of new minimum standards for solid waste landfills, for example, landfills across the Nation-especially those serving small rural communities-will be closed. Communities are facing difficult and costly decisions related to new landfills as well as to other environmental issues. Consumers and business persons also face an almost overwhelming array of waste management decisions as they strive to balance needs for efficiency and productivity with those of environmental sensitivity.

The making of policy decisions about solid waste management are an ongoing priority item for local governments. For example, finding ways to comply with the stringent and costly landfill requirements of the Resource Conservation and Recovery Act will continue to be of concern as communities work to meet the new deadline (extended by 6 months from October 1993) recently set by the Environmental Protection Agency (EPA). Accordingly, now is the "teachable moment" in waste management education for local officials, businesspersons, home owners, youth, and virtually all other community members.

Extension's Waste Management programs assist communities in implementing cost-effective, integrated waste management systems based on maximum reduction, recycling, and processing of waste and on the establishment of state-of-the-art engineered landfills. Through Extension education, consumers and businesses are enabled to successfully change their waste management strategies in the direction of statutory compliance and environmental well-being.

Waste management education-particularly on such topics as composting as a landfill alternative-offers excellent opportunities for networking and team building with other USDA agencies, the EPA, and the private sector. Waste management also provides a natural setting for overall environmental education in relation to natural resource use and re-use, waste reduction, and waste disposal. Public interest in methods of composting and of compost application to agricultural land continues to present significant educational opportunities for land-grant universities and other educational institutions.

STATUS AND ACCOMPLISHMENTS

A highlight of the Extension Waste Management National Initiative is the development of timely, effective educational materials. In addition, Extension programs are catalysts in stimulating attitudinal and behavioral change toward the environment on the part of youth, families, farmers, business persons, community leaders, and public officials. The Extension Service-USDA is working closely with other federal, state, and local agencies to develop collaborative efforts in waste

Significant System accomplishments under the Initiative include the following:

- Coordinated National Extension Composting Workshop, with Composting Council (CC) support.
- Developed an AG*SAT waste management videoconference curriculum for county agents and local officials.
- Developed decisionmakers' guide on municipal solid-waste composting policy and related technical issues.
- Coordinated USDA implementation of Sec. 1456 of the 1990 Farm Bill: "Composting Research and Extension Program."
- Provided USDA liaison with the CC.
- Produced, with CC support, the *Municipal Solid Waste* composting video and study guide.
- Participated in an EPA working group to develop an Environmental Extension Network and promoted the Network throughout the Cooperative Extension System.
- Created, in collaboration with the EPA Office of Air Quality, public service announcements promoting composting as an alternative to leaf burning.
- Disseminated informational materials on multi-jurisdictional waste management agreements.
- Published the *On-Farm Composting Manual* in collaboration with the North Central Region agricultural Engineering Service.
- Developed a waste management component for the Expanded Food and Nutrition Education Program curriculum.
- Updated the *Waste Management Educational Materials Directory*.
- Developed a guidebook on recycling cost/benefit tradeoffs and market development.



WATER QUALITY

WHY AN AGENDA FOR WATER QUALITY?

In 1989, the USDA was designated as the lead federal agency for addressing the issue of agricultural nonpoint source contaminants. Subsequently, a Water Quality Program plan was developed and implemented. This plan encompassed among other efforts, the Water Quality National Initiative created in the previous year by the Cooperative Extension System (CES).

The Extension Service, U.S. Department of Agriculture (ES-USDA) and CES are playing a major role in implementing the USDA plan. The CES Water Quality National Initiative reflects and addresses specific categories of local need. The objectives for this National Initiative are to:

- prevent/reduce water degradation from plant nutrients, pesticides, and animal wastes;
- protect/improve the quality of private, domestic-use well water; and
- protect/improve water quality through public issues education.

STATUS AND ACCOMPLISHMENTS

Water Quality programming across the Cooperative Extension System is both intensive and extensive. Intensive, targeted program efforts include demonstration and nonpoint-source hydrologic unit area (watershed) projects in collaboration with the Soil Conservation Service (SCS), the Agricultural Conservation and Stabilization Service (ASCS), and state and local agencies. Intensive program efforts also include regional initiatives such as the Chesapeake Bay, Colorado River, and Great Lakes Projects, as well as work to improve water quality in nationally important estuaries.

Extensive water quality programs have been implemented in all 50 states. These initiatives involved either integrating water quality concerns with ongoing programs and delivery mechanisms, or creating programs such as those focused on wellhead protection and drinking water quality. Initial efforts in all states focused on developing program materials to facilitate program implementation.

All state CES programs have conducted direct staff development and training in water quality education--both for their own staff members and for those of other agencies such as SCS and ASCS.

Examples of significant CES accomplishments in water quality programs include:

- Programs in all 50 states and the U.S. territories with a focus on the water quality implications of pesticides, nutrients, animal waste, and wellhead protection, as well as on public issues associated with water quality.
- Seventy-four interagency nonpoint-source hydrologic unit area projects in 48 states, dealing with water quality impairments attributed to agricultural nonpoint sources.

- Sixteen interagency water-quality demonstration projects to accelerate the adoption by farmers of agricultural production practices that are both cost-effective to implement and environmentally sound.
- An online National Extension database of water-quality educational materials that provides real-time online access and a keyword search to increase the cost-effectiveness of program materials development.
- Developing and pilot testing an interagency (SCS, ES, and EPA) program to extend the availability of the recently developed Farm*A*Syst program materials nationwide. A total of 44 states are adapting the program to provide farmers with a self-administered risk analysis for their farmsteads.
- Implementing an Extension component at each of the five sites of the Midwest Research Initiative to ensure the transfer of new research information throughout CES.

The CES commitment to delivering water quality programs continues. Current emphases include strengthening current program efforts; bringing Extension into full partnership with regional and multistate programs; perfecting and using reporting systems to consolidate data on Extension water quality programs; documenting accomplishments; and defining and developing the Extension role in water quality programs authorized by the 1990 Farm Bill, the 1990 Coastal Zone Management Act reauthorization, and the pending Clean Water Act reauthorization.



YOUTH AT RISK

WHY AN AGENDA FOR YOUTH AT RISK?

Extension's National Initiative on Youth At Risk targets the urgent social and economic needs of young Americans. One goal of the Initiative is to expand Extension's outreach to youth and families-particularly to those most vulnerable because of poverty, insufficient parental and community support, and negative peer pressure.

Extension's Youth At Risk program focuses on prevention and intervention rather than treatment. Extension staff reach out to youth and families through an educational delivery network anchored in every community.

STATUS AND ACCOMPLISHMENTS

Partnerships in which people work together to benefit youth, families, and communities are an integral part of Extension's Youth At Risk National Initiative. The Extension Service, U.S. Department of Agriculture (ES-USDA) works closely with other federal agencies and the private sector to activate Youth At Risk programs across the country. Extension programs are not meant to stand alone, but rather to work in synergy with the outreach efforts of the local community-particularly those of the local school system.

In Fiscal Year 1991, the federal government provided \$7.5 million to support Extension's Youth At Risk Initiative. As a result, Extension created 70 programs nationwide in three target areas: school-age child care education, reading and science literacy, and coalitions for high-risk youth. In Fiscal Years 1992 and 1993, an additional \$10 million in federal funds helped sustain and strengthen 68 of these established programs and allowed for the creation of 30 new programs nationwide.

The National 4-H Council, which contributes \$100,000 each year to support the Youth At Risk Initiative, plays an important role in resource and program development. The DeWitt Wallace-Reader's Digest Fund granted a \$3.5 million for staff development and training for the Initiative. Grants from other companies, foundations, and private citizens support Youth At Risk programming in numerous local communities across the Nation.

Community CARES is a project created as part of a W.K. Kellogg Foundation funding package of \$5.926 million over a 3-year period. As a part of Community CARES, seven Centers For Action were created to provide nationwide technical assistance and training at 70 federally funded Youth At Risk program sites.

New Directions for the Ohio Cooperative Extension Service

The Ohio Cooperative Extension Service, The Ohio State University is moving in new directions to address the needs and concerns of Ohio's citizens. Our primary goal is to educate Ohioans in a practical way where they live and work. Everyone benefits from our programs, which focus on major issues facing Ohioans today.

Identifying New Directions

Ohio's Extension faculty, staff, and volunteers have worked to identify major areas of program focus and issues critical to Ohioans. County needs assessments were conducted to identify issues and concerns to be addressed by programs during the four-year period of 1992-95. During 1990 and 1991, every Ohio county reviewed societal, economic, demographic and cultural changes to determine needs for programs. A variety of methods, including community "Speak Out" meetings, advisory committees, and surveys were used to gather information from local citizens. More than 8,437 Ohioans participated in needs assessment efforts statewide. Concurrently, academic departments at The Ohio State University were reviewing departmental program priorities, which also influenced the outcome for Extension.

Needs of local citizens and communities, new research findings, and technical information were summarized. Four major program focus areas and eleven issues were developed:

- Economy
 - Development
 - Management
- Environment
 - Natural Resources
 - Water Quality
 - Waste Management
- Family/Individual/Youth Development
 - Strengthening Relationships
 - Basic Living Skills
 - Resource Management
 - Nutrition/Diet/Health/Safety
- Leadership
 - Leadership Skills
 - Public Policy

Table 1.

CITIZEN CONTACTS BY RACE AND GENDER									
Method Utilized	Frequency of Use	Black	Hispanic	American Indian	Asian	Caucasian	Male	Female	Total
FACE-TO-FACE CONTACTS									
A. Speak Out Meetings	75	83	9	2	7	1,022	1,274	783	1,936
B. Other Group Settings	71	36	3	1	3	1,350	1,085	714	1,162
SURVEY CONTACTS									
C. Local Surveys	15	16	10	2	3	1,215	614	702	1,736
D. Statewide Surveys	52	80	6	6	4	1,242	1,912	1,835	3,987
OVERALL CITIZEN CONTACTS		179	27	8	15	4,833	3,024	3,601	8,437

* Source: County needs assessment participation reports and survey data submitted for analysis (09/22/91). Data reported by 83 counties.

* Total number of contacts reported by method does not equal the sum of race/gender categories. Some counties reported total contacts only.

Programming for New Directions

Extension's Assistant Directors from Agriculture, Home Economics, 4-H Youth Development, and Community and Natural Resource Development developed a matrix of major program focus areas, issues, and keywords describing local and departmental needs. As new needs emerge during the next four years, the keywords may change. The matrix on the following 2 pages illustrates the interdisciplinary programming efforts occurring among the Extension program areas.

It also shows how the various program areas will individually address the issues.

Program Focus Areas

The Ohio Cooperative Extension Service has assigned high priority to each of the program focus areas. Much of what we have concerned ourselves with during the past 78 years can be found within the program focus areas.

So what is going to be different?

Extension will adopt a new way of looking at needs and will be able to address new issues as they occur. We will build on our historic strengths, draw on the total resources of the University and other sources of education and research and adopt a task force approach for anticipating and dealing with specific issues.

Economy

A strong and diversified economy offers opportunities for economic growth, but maintaining Ohio's high societal standards requires thoughtful planning. Ohio farmers must produce the highest-quality products and adapt to economic change. Ohioans are challenged daily by changing employment opportunities, eroding purchasing power, fluctuating income, and limited resource management skills.

Environment

Environmental awareness, appreciation, and analysis are crucial for Ohioans, because our land, water and air are limited resources that are delicately linked to one another. Environmental issues related to these

Programs are localized to address the needs appropriate to their communities. The tables on pages 6-12 display the program focus areas and issues identified in Ohio counties.

resources, involving pesticides, solid wastes, toxic industrial and household chemicals affect every community. Programs will be developed to assure Ohio residents an adequate and safe water supply, clean air, protected marine and natural resources.

Family/Individual/Youth Development

Individuals and family members, both young and old, seek knowledge, competencies, and skills to manage and make decisions, especially during times of transition and stress. These transitions may relate to family changes, jobs, community involvement, and concern for quality of life. Problems such as poverty, teen pregnancy and suicide, substance abuse, underemployment, and unemployment affect the health and well-being of people everywhere. Programs will be designed to empower individuals, families and youth to realize their potential.

Leadership

In the complex society of tomorrow there will be an increased need for community leadership. Educational programs help leaders of organizations and communities as they confront policy development, resource acquisition and allocation, negotiation, cooperation and conflict management between competing interests. Extension believes that people in communities with a well-developed and diversified leadership base are better prepared to deal effectively with economic and quality-of-life issues. Leadership programs build self confidence and develop skills for problem solving.

NEEDS ASSESSMENT PROCESS 1990-91
OHIO STATE UNIVERSITY EXTENSION
AN OVERVIEW

TRAINING:

Throughout the spring of 1990, staff at county, district and state level received training about the value of needs assessment, its role in program development, and methods suitable to Extension. A resource notebook was developed. Training was incorporated into ongoing Spring Conferences. \$300 stipends were made available to counties to help defray needs assessment expenses, provided a plan was submitted and approved.

METHODS USED: Three methods were used in each county:

1. Demographic profiles- three profiles (agriculture, general, and business) were developed for each county in the state. The profiles were used by staff to examine characteristics of potential clientele groups and to show community trends. The materials were also used with committees and community leaders.
2. Mail survey- The survey was developed at the state level and data analysis provided at the state level. Counties determined the sample and administered the instrument. Since the 1987 long range plan involved an extensive random survey, the focus this time was on a survey to help counties check the response of participants in community "Speak Out" groups.
3. "Speak Out" Groups- This was a modified town meeting approach. Each county was encouraged to involve 50% Extension users and 50% non-users in this group. Training materials included discussion questions, nominal group techniques and suggested meeting agendas.
4. Counties were also encouraged to use other methods to help them assess the needs of particular target audiences. Some used focus groups, telephone surveys, youth retreats, key informant interviews, and networking with other organizations.
5. Each counties submitted a listing of priority needs and target audiences based upon the combination of methods used. Those listings were compiled to determine the statewide priority listing.
6. At the same time, academic departments were charged with priority setting by the Vice President for Agricultural Administration. They each submitted a listing of identified needs to Extension, which were incorporated in the program priority setting process.

7. The Director, Associate Director, and Assistant Directors reviewed the needs assessment summaries and worked with the Leader, Program Development and Leader, Evaluation to create the Program Focus and Issues, which will be our organizational framework through 1995.

Prioritization and Program Planning:

By May 15, 1991, all counties reported listings of priority needs to state administration. The information was summarized by county, district, state, program area, issue area, rural and urban areas. The Administrative team reviewed and determined statewide priorities at a retreat in July.

A special emphasis to help personnel with program planning was held by satellite in May, 1991. The program "Getting Ahead by Letting Go" was designed to help personnel analyze ongoing programs, evaluate programs according to specific criteria (such as mission, need, resource base, etc.) and determine future directions for programs. Programs were classified by the individual as ones to continue, revise or re-design, phase out or give away, or develop based upon new directions. The support network of mid-managers and district specialists provided ongoing encouragement and support of personnel as they actually changed program directions.

NEW DIRECTIONS FOR THE OHIO COOPERATIVE EXTENSION SERVICE

Extension faculty, staff and volunteers have worked to identify major areas of program focus and issues critical to Ohioans. During 1990 and 1991 more than 8000 Ohioans participated in needs assessment efforts statewide. Concurrently, academic departments at The Ohio State University were reviewing departmental program priorities, which also influenced directions for Extension. Four major program focus areas emerged:

Focus Area	Frequency of needs in focus
Family/Individual/Youth Development	756
Leadership	419
Economy	348
Environment	341

Family/Individual/Youth Development

Family issues and problems related to youth and family accounted for 40% of the needs in this area. Youth problems with personal well being represented 10% of the needs. Needs concerning resource management, nutrition, and balancing work and family were nearly equal in emphasis. Emerging areas in this emphasis include health issues, day care, elderly issues, youth life skills and youth decision making skills.

Leadership

Community services/resources and youth needs in the community represented nearly 1/3 of the needs identified in this area. Agriculture and the community, general leadership development and youth leadership development were of significant importance. Rural/urban issues represented over 15% of the needs in this area. Agriculture public policy is an emerging area of concern.

Economy

Needs related to Farm Management and Marketing and the area of Economic Development accounted for over 2/3 of the needs concerning the economy. Agricultural Production and Employment Issues accounted for the remaining one third.

Environment

Needs related to Agriculture and the Environment were most frequently mentioned in this area, accounting for nearly half of the reported needs. Other priority issues identified concerned waste management, water quality, general environmental issues and natural resources.

Additional Needs

Though Extension did not identify education as a major focus area for programming, many needs were identified concerning school financing, quality and availability of education, and the need

for specific types of education in Ohio communities, such as youth and adult job training.

Organizational Needs

Needs not categorized with the program focus areas yet important to Extension as an organization concerned marketing Extension, change, futuring, and educational methods. Marketing, promotion and image were also mentioned concerning 4-H and Agriculture Public Policy.

Urban Needs

A diversity of needs were identified in Ohio's 11 urban counties. Community issues, family issues, and health issues were nearly equal in importance, representing about 1/3 of the overall needs reported. Another 25% of the needs included food and nutrition, leadership, waste management and education. The remaining needs were distributed among areas such as agriculture, economic development, water quality, youth issues, environmental issues, urban horticulture and urban gardening.

PESTICIDE APPLICATOR TRAINING

Ms. KAPTUR. All right, I appreciate that, and any information specific to Ohio, I would also be most grateful for.

I will ask only one other question here, and that deals with your pesticide applicator training program, and desire for additional funds there.

My state agricultural director came in this week expressing concern about the ability of our state to meet the April 21st deadline for the enforcement of EPA's new worker protection standard for agricultural pesticides.

I'm wondering to what extent the Extension Service may have been involved already in helping our farmers and our states meet these deadlines, and is Ohio unusual in the fact that they don't think they are going to be able to meet the deadline?

Dr. GEASLER. I think there is a lot of concern about that nationally. We've been involved in disseminating the information and educational programs around those regulations to assist in hoping to meet that mandate.

Our role is not regulatory. We're not out there monitoring the progress or checking on producers. Our role is to make sure they have the information necessary, and the educational understanding that's necessary to accomplish what they need to accomplish.

SUSTAINABLE AGRICULTURE

Ms. KAPTUR. Mr. Chairman, I will ask Dr. Williams to also submit for the record how he views the entire area of sustainable agriculture, particularly in terms of re-using agricultural waste materials and even animal waste, wood waste, beyond the composting that we hear so much about.

I'd like to know what Extension is doing in the area of sustainable agriculture in using a lot of these materials, especially if they have organic contact, back on the fields of this country.

I am very interested in that particular item in the budget.

Dr. WILLIAMS. We will provide you with that.

[The information follows:]

SUSTAINABLE AGRICULTURE

The Extension Service views Sustainable Agriculture as a major priority for the U.S. agriculture sector. The nation continues to face major challenges in maintaining economic competitiveness while concurrently assuring responsiveness to growing societal concerns of agricultural production practices and the environment. The public and private sectors have supported research to improve economic competitiveness of the agriculture sector, develop alternate crops and new uses, and environment enhancing technologies, methods and practices. These investments have resulted in, and will continue to provide, improved technologies and production methods. The Extension Service must bring the agriculture community and rural America new environmentally sound technologies, new resource conserving crops and new uses, and production practices which can be efficiently integrated into holistic farming and ranching systems.

The Cooperative Extension System has responded to the sustainable agriculture issues by allocating more than 600 FTE's from our state partners across the country to programming efforts including:

Developing human and data networks that enhance the transfer of practical, reliable, and timely information to farmers and ranchers;

Analyzing and evaluating technologies with promise for the development of globally competitive, environmentally sound agricultural systems;

Validating research demonstrations that illustrate the effectiveness of sustainable methods and practices in whole-farm systems;

Providing technical training for Extension and other professionals involved in developing sustainable agriculture systems; and

Disseminating appropriate technical guides and/or other educational materials that promote the practical application of sustainable whole-farm systems.

One specific example includes PLANETOR (version 2), a second-generation computer program that will provide producers and ranchers with economic and environmental data essential for making informed decisions about their farm operations.

Increasing attention is being given to the role of compost in sustainable agriculture, both as a limited substitute for fertilizers and as it enhances soil quality in terms of tilth, water retention, and erosion control. Applied research is underway in several states on direct application of yard debris to fields as a way to avoid the costs of composting while retaining the benefits of added organics in the soil. Early results indicate that direct land application is a cost effective alternative to composting yard debris when application rates are properly controlled. Purdue University has published CES Paper No. 267, "Land Spreading: An Alternative for Yard Waste Management," that assembles some of the existing knowledge and experience on land spreading of yard waste into an operational manual for farmers and local government officials.

FY94 SUPPLEMENTAL

Mr. DURBIN. Thank you very much. My last question relates to the \$1.4 million in the supplemental to the Extension Service for late potato blight. Can you tell me how that's going to be used?

Dr. WILLIAMS. That's for the State of Maine and it will be used over a two year period to help alleviate some of the problems and do some of the research on the problem they are having with the potato blight.

The draft proposals have been submitted from Maine, and they are under review at this time.

It is proposed that \$150,000 of the supplemental is proposed to go to the state experiment station through the Cooperative State Research Service.

Mr. DURBIN. How many people will be hired?

Dr. WILLIAMS. I really don't know how many, if any people will be hired for this project.

Mr. DURBIN. And what is your time table to spend this money?

Dr. WILLIAMS. We have a two-year time table.

Mr. DURBIN. How soon will you be starting on this?

Dr. WILLIAMS. We have the funds now and we are starting immediately.

Dr. GEASLER. The draft plan has been submitted and is in review now.

Mr. DURBIN. Okay. Mr. Skeen.

TOURISM PROGRAMS

Mr. SKEEN. Thank you, Mr. Chairman, one of the newest programs that you have is this tourism extension project, and it has been of great help to us in New Mexico, and we would like to have an update on what you are doing nationwide with it, particularly in the southwest and the west.

Dr. WILLIAMS. We have a meeting planned for all Extension Directors and Administrators about two weeks from now here in Washington. One of the items on the agenda is the rural tourism program.

We have a person who is coming here from New Orleans who wants to share some things with the Directors from around the

States. Some of the things that we've almost forgotten off-the-beaten path when the interstate highways went through and cut off the small towns.

There are a lot of things there that are of interest to people and that they want to see and want to do, and it's kind of a fast-growing area for the country.

Mr. SKEEN. It's a great economic interest.

I commend you on initiating the program, and it's working well. We're very aware of it in New Mexico.

Dr. WILLIAMS. We are funding some projects on that, and will provide that information for the record.

[The information follows:]

**TOURISM DEVELOPMENT:
A SUGGESTED APPROACH
FOR THE COOPERATIVE EXTENSION SYSTEM**

A Report to the System

**-Ways the CES can change its
Program priorities
Organizational structure and
External relationships
to meet the shifting needs and priorities
of society**

Prepared by:



The National Extension
Travel and Tourism
Advisory Committee

December 1993

Preface

A suggested approach for Cooperative Extension System tourism development programs for "the next millennium" follows. This statement provides possible roles and directions in tourism education for local, state and regional Extension programs in the foreseeable future.

This approach for Extension was developed by the National Extension Travel and Tourism Advisory Committee, whose purpose is to guide coordination of the strategic plan outlined at the conference, "Future Tourism Development: Programming in the Cooperative Extension Service for the Next Millennium," held in Milwaukee in the fall of 1992. The Advisory Committee formed from the Planning Committee for that conference is chaired by Sue Sadowske of Wisconsin. See Appendix B for a full listing of Advisory Committee members.

This suggested approach also encompasses ideas from the Tourism Design Team of the CES National Initiative, "Communities in Economic Transition," whose membership is also shown in Appendix B. Glenn Weaver, Missouri, is chairman of that group.

The last program statement on Extension involvement in tourism (and recreation) was issued in 1978: RECREATION AND TOURISM-- Challenges and Opportunities for Cooperative Extension and approved by the Community Resource Development and Public Affairs Subcommittee of the Extension Committee on Organization and Policy. Uel Blank, then a member of Minnesota Extension, was chairman of the Recreation and Tourism Task Force. Extension today could do worse than take up the challenges posed in that 15-year-old document. Excerpts from "Challenges and Opportunities" are accordingly contained in Appendix A.

Donald L. Nelson of Extension Service-U.S. Dept. of Agriculture (ES-USDA) is principal author of this paper and appreciated assistance from Sue Sadowske, Dave Marcouiller, Bill Norman and Bill Ryan, Wisconsin; Don Holecek and Phil Alexander, Michigan; Allan Worms, Kentucky and Ralph Otto, ES-USDA. Twenty other persons have reviewed this paper; their names appear in Appendix C.

December, 1993

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Travel and Tourism Today

In The World

Travel and tourism is a large industry. In fact, some say it is the world's **largest** industry. The Travel Industry World Yearbook for 1991 says that "Tourism spending worldwide, including both domestic and international travel, reached \$2.75 trillion in 1990, an increase of 5 percent over 1989 (revised). This is almost three times (what) the world spends for defense." A study reported in the Yearbook found that "travel and tourism is...a major contributor to global economic development," generating "More than \$2.5 trillion in gross output, which is 5.5 percent of the world GNP (Gross National Product), and was growing at a rate almost twice as fast as world GNP" (in 1989).

In the United States

About \$385 billion is spent by foreign and domestic travelers in the United States and in its affiliated territories **every year**, according to the U.S. Travel Data Center. More than 10 million people--one in 25 of us--travel in the United States **every day**. Nearly six million people are paid \$83 billion yearly to work within the Nation's travel and tourism (T&T) industry, with thousands of new jobs created every year. Over the past decade, T&T industry employment has grown 43 percent, more than twice the growth rate for all U.S. industries. In 1982, there were nearly 336,000 firms in the T&T industry, with 98 percent classified as small businesses.

Travel and tourism is America's third largest service industry and the number one business services export industry. About \$43 billion in travel tax dollars will be spent on road and building construction, school project support and other local, state and federal public service programs this year.

The interest in T&T in communities across the Nation is increasing. T&T is an industry deserving of special and renewed attention predicated on careful planning, development, marketing and continued good management.

Critical Issues

If the Cooperative Extension System is to deal effectively with tourism development--if it is to contribute to community and economic development and to support small business--it must deal with the following critical issues:

Basics

There is no agreed-upon **definition** of tourism, a fundamental problem. Nor are there consistent **data** on tourism impacts, which hinders tracking them over time.

Tourism has been viewed as a **frivolous activity** rather than as an industry having beneficial economic impacts.

In fact, some economists say that tourism isn't an industry at all, but only a loose collection of different **service** industries. Because tourism cannot be identified through specific "Standard Industrial Code" categories, there is not an agreed-upon definition of tourism and lack of consistent data means the "industry" has failed to achieve the recognition it deserves in the eyes of key decision makers.

Tourism and the Environment

As tourism continues to grow at a dramatic rate, there will inevitably be conflicts between tourist activity and the **environment**. This brings up the issue of **sustainable** tourism. Sustainable tourism development can be thought of as "meeting the needs of present tourists and host regions while protecting and enhancing opportunity for the future." Through informed planning, tourism development can proceed without undue threat to the environment. Indeed, the economic success of most tourism developments is dependent upon protecting the environment, as it is often a key element in attracting tourists to particular destinations.

Organizational Structure

The tourism industry lacks the infrastructure to adequately support and foster the growth of such a diverse and segmented industry. At the national level, the U.S. Travel and Tourism Administration (USTTA) is the only Federal agency with legislative responsibility directly related to tourism. Its mission is quite narrow and its primary purpose is to promote the United States as a tourism destination area to foreign tourists. At the State level, the State offices of tourism also devote at least 80 percent of their efforts to **promotion**, with education

and research dividing the rest. Development gets little or only incidental support.

As an industry, the various components have their own associations, such as those for restaurants, hotels/motels, etc. Their primary focus is related to the problems and concerns of the services they provide. At the local level, most communities use volunteers on a tourism committee or organization to give leadership to the tourism interests of the area.

Public Awareness and Higher Education

As an evolving industry, tourism has not received the level of public support needed to adequately address its growing needs. Higher education is still formulating curricula in the field of tourism. A great deal of the educational work related to tourism and travel, broadly defined, comes out of the field of natural resources. Alternatively, most of the existing programs focus on single interest curriculum--like hotel/motel management, food and beverage management, travel agency management or generic curricula in marketing and business management. Job training and career counseling are also limited or nonexistent. This lack of public support and understanding further hampers development, as it limits access to well-trained individuals to fill leadership positions in the industry.

Research

Information about consumer or tourist behavior is essential for good management of a tourism business and for marketing the area. Unfortunately, accurate information is often difficult and expensive to acquire, especially for local chamber of commerce offices and small businesses. Tourism-related information is available at the national level through the U.S. Travel Data Center or the USTTA, but the information is not interpreted at a level useful to most local tourism organizations and, in some cases, the information is available at a cost prohibitive to local groups.

In addition to **market** information, information is also needed about the economic, social and environmental impacts of tourism development in order for communities to understand the consequences of development options.

Demographics

Tourism is the largest employer in 13 States and three insular areas. It tends to be the big employer on the corners of the Nation (AK, HI, FL, ME, VT, NH) and the insular areas of Guam, the Virgin Islands and the Northern Marianas. All of these

Tourism Development

4

States and territories, except Vermont, have coastal areas. Most also have mountains. The other seven States where tourism is the largest employer are in the Rocky Mountain area (AZ, CO, ID, NV, NM, UT and WY). The coast and mountains seem to be natural attractions for travelers. Population and tourism will continue to gravitate toward these coastal regions, generating both opportunities and challenges.

However, travel/tourism growth is important to many other States lacking coastal or mountain attractions also. Michigan, for instance, has neither mountains nor seacoast, but has more than 3,000 miles of Great Lakes shoreline, is among the leading states in boating, downhill ski resorts, campsites, registered snowmobiles and second homes; in Michigan, the bed and breakfast business has blossomed, as has historic tourism, charter boat fishing, trail use and so on.

Slow overall population growth, the "baby boomer" bubble and increasing life expectancy will combine to increase the proportion of older people in the Nation's population. Travel is a high priority for the senior market and they have the time and (usually) the financial resources to travel extensively. Destinations which orient their travel product to the needs of seniors will capture a larger share of this market segment and may eventually experience net in-migration driven by seniors relocating to their favorite vacation destination when they retire.

The Economics of Tourism

The weak U.S. dollar makes all U.S.-produced exports, including tourism, attractive in the international market place. So long as the dollar remains weak in international markets, the positive U.S. travel trade balance will grow. Foreign tourists tend to spend more time and money than do domestic tourists (foreign visitors spend seven times more money than domestic travelers; the majority of foreign visitors spend more than eight nights here).

Wealth and income is distributed unevenly across this country and this disparity is projected to grow in the future. Thus, marketing focused on the average-income traveler will likely appeal to a shrinking market segment.

The debt accumulated by individuals, corporations and the government is possibly the single most important factor in the tourism equation, since tourism is sensitive to shifts in prices and disposable income, although historically it has performed as a recession cushion.

Employment

The travel and tourism industry is most often perceived as an industry offering primarily **low wage** and **low skill** jobs. Thus, many question efforts to stimulate growth in tourism. Manufacturing jobs are regarded as superior, because the average paycheck is bigger, but the difference is smaller than most people realize. Also, there are nearly five times as many service-producing jobs as factory jobs and they often provide better working environs.

The inherent **seasonality** of the travel and tourism industry, e.g., peak demand in specific seasons, suggests that the industry will encounter labor shortages in some activity areas and locales, especially during peak periods. Travel and tourism will probably face rising labor costs and will need to develop new sources of labor supply. Since competition will limit ability to raise prices and/or reduce quality, the industry will also need to develop labor-saving strategies and effective training programs to keep costs low and quality high.

Communities

Many communities considering implementing a tourism development program cite examples of tourism development problems in other communities. If communities are to use tourism effectively as an economic development strategy, they may want to identify important local community and tourism development **values**:

- Basing tourism development on **authenticity** and a sense of place.
- Assessing the true **benefits and costs** of tourism.
- Using tourism as a **diversification** rather than a substitution strategy.
- Developing and delivering quality services.
- **Sharing the benefits** of tourism and developing local control.

New tourism can yield many economic benefits, including:

- A recession-resistant income source
- Economic growth
- Increased tax revenue
- A labor-intensive industry
- Employment opportunities
- Small business opportunities
- Less infrastructure needs than some other kinds of development options.
- Improved quality of life for the local citizenry

Yet, tourism can bring undesirable by-products:

- Traffic congestion
- Displacement of local residents and businesses
- Shops catering to visitors rather than to locals
- Resentment of the visitors
- Community service needs, such as police and fire protection, street lights and sewers
- Disruption of the local ecosystem

The New Tourisms

Agri-tourism; cultural, ethnic and historical tourism; eco-tourism; heritage tourism and all the other "New Tourisms" have distinctive issues associated with them. Collectively, they point to additional opportunities in tourism development.

Negative Factors

Among the possible "negatives" for the future of tourism, mentioned by Futurist Michael Marien at the recent Extension Conference, are:

- The possibility for a continuing and perhaps worsening, **economic downturn**
- **A consumption tax**
- **Environmental disaster**
- Worsening **transportation** systems
- **Communications** alternatives (as a substitute for travel)
- **Tourism oversupply**
- Host community **backlash**

Another issue is **safety** and **security**, whether at rest stops or at airports. This is especially a "negative" for an aging population.

The Need for Extension Education in Tourism Development

The tourism sector has a limited organizational structure with little or no educational research or technical assistance support for its many small businesses. Although CES has had some programming efforts in travel and tourism since the late '40s, these efforts can be characterized as lacking a central focus, being unevenly distributed among the States and offering only sporadic opportunities to share resources.

However, CES' involvement in tourism development education programs is substantial, although not at a level commensurate with the industry's economic importance and growing need for assistance. In the newsletter UPDATE, Tourism and Commercial Recreation, we read that people in Extension with at least an **interest** in this educational area are found in every State save one. The mailing list for this newsletter includes more than 250 people with Extension linkages. Despite severe fiscal restraints, in the fall of 1992, interest in tourism was further demonstrated when 78 people from 33 States attended the CES conference "Future Tourism Directions" referred to in the Preface.

Extension professionals are seeking ways to stay on the cutting edge of tourism development.

CES is being constantly called upon to deliver the kinds of educational programs which will help people make informed decisions about tourism investments, tourism's role in community economic development strategies and a host of other tourism management, planning and policy issues.

Most tourism businesses are classified as small businesses and, as such, often are unable or unwilling to give leadership to the larger context of a tourism industry. The few communities which have been able to surmount the many obstacles to developing effective tourism industry leadership have the most viable tourism industries. This demonstrates the importance of organizational structure as an issue, one that the CES has successfully addressed many times in other contexts.

Business Education and Technical Assistance

The major function of most tourism organizations has been **promotion**. While narrow, this focus has been beneficial, especially for established businesses. The effectiveness of these promotion efforts are rarely evaluated and, even when effective, still fail to address individual business needs for education and technical assistance in other areas of marketing, management and planning. The lack of education and technical assistance slows

growth, contributes to business failures and lessens the probability that a community/area will reach its potential.

The ability of the CES specialist to assist the industry is also constrained by the lack of research available on tourism. These are only **some** of the issues facing individuals, communities and businesses as they contemplate the question: "Is tourism for me (us)?" The educational opportunities are seemingly limitless.

The Tourism Design Team of the Communities in Economic Transition (CET) National Initiative (see Appendix B for members) analyzed the situation surrounding the tourism industry and concluded:

- Tourism does have the potential to become an even greater factor in the **social, cultural, and economic development** strategy for America.
- The potential of tourism as an economic development strategy would be enhanced if Extension would provide more **education** directed toward tourism development.
- The Extension Service has a strong **history** in tourism education and some of the national leaders in tourism development education should expand their efforts in order to enhance the economy.
- Tourism education and technical assistance directed towards **private enterprise development** can contribute to the expansion and retention of existing businesses and create new businesses, new jobs, income and profits and generally improve the economy of the area.

This publication spells out ways the CES can change its program priorities, organizational structure and external relationships to meet the shifting needs and priorities of society.

Objectives and Tasks for CES

The most notable outcome of the conference "Future Tourism Development: Programming in the Cooperative Extension Service for the Next Millennium," was the establishment of strategic actions in tourism and travel and the commitments made by conference participants to work collaboratively to realize their plans. These planned actions and related commitments are outlined here:

Action 1

To articulate the **education and research** roles of CES in travel and tourism to external and internal stake-holders. To establish tourism and travel as a **recognized, supported program** within the Cooperative Extension System. To develop **partnerships** for programming in tourism and travel.

Action 2

Establish **educational** initiatives in tourism and travel for clientele and for Extension faculty and staff.

Action 3

Establish a nationwide **"library"** of tourism and travel information, data and reports. Suggested name: Tourism Information Resource System (TIRS).

Action 4

Build a national **research** base and a comprehensive research agenda for travel and tourism. If the CES is to become more effective in its traditional role of disseminating research findings to communities and to individual needs, it is especially important that CES assign a higher priority to tourism development research.

Action 5

Hold another National Cooperative Extension **Workshop** on tourism and travel within the next two years.

People in Cooperative Extension are chairing National Extension Tourism Subcommittees or Task Forces and the groups are working on the following:

- Marketing Subcommittee, Allan Worms, Kentucky, Chair
- Research Task Force, Dave Sharpe, Montana and Eric Thunberg, Florida, Co-chairs

Tourism Development

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- Information Resource System Task Force, Phil Alexander, Michigan, Chair
- Training Task Force, Robert Townsend, Vermont, Chair
- Future National Extension Workshop Task Force, Margaret Moore, Louisiana, Chair

Priority Programs for Target AudiencesPresent

An interpretation of the travel and tourism efforts reported by State Extension offices in a survey preceding the 1992 National Extension workshop showed the following programs in place in CES:

I. Programs designed to establish **foundations** for long-range development and management of a local/regional tourism industry, including processes and community resource development.

- A. Getting tourism organized
 - 1. Community awareness and education
 - 2. Organizational development, i.e., boards and associations
 - 3. Leadership training
- B. Tourism planning and development
 - 1. Community, county, regional and state tourism planning
 - a. Assessments
 - b. Analysis
 - c. Goal setting
 - d. Strategic planning
 - e. Evaluation
 - 2. Tourism development
 - a. Market research and analysis
 - b. Strategy development
 - c. Feasibility analysis
 - d. Evaluation
- C. Management of Tourism
 - 1. Hospitality training
 - 2. Building linkages and networks
 - 3. Applied research
 - 4. Strategic marketing planning
- D. Evaluating the impacts of tourism
 - 1. Economic
 - 2. Social-cultural
 - 3. Physical/environmental

- II. Programs designed to meet the immediate **short-term** objectives and topical issues as they arise. These usually have lasting value, but employee and leadership "turn-over" requires repeat training.
 - A. Tourism marketing and promotion (e.g., How to design a brochure)
 - B. Strategic planning
 - C. Marketing planning
 - D. Conflict resolution
- III. Programs designed to **help individuals and encourage business development**. Workshops and counseling are provided in two areas:
 - A. The basics of the business. What you should know about the business before you proceed.
 - 1. Business start-up
 - 2. Pricing for profit
 - 3. Financial management and planning
 - 4. How to get financing
 - 5. Personnel management
 - 6. Marketing
 - B. Business feasibility and investment analysis. Is it a viable option?
 - C. These programs are designed to address the unique aspects of different types of tourism operations, including:
 - 1. Bed and breakfasts
 - 2. Hotels, resorts and motels
 - 3. Restaurants
 - 4. Campgrounds
 - 5. Small retail stores
 - 6. Craft businesses
 - 7. Farm tours and vacations
 - 8. Fee hunting and fishing
- IV. Programs addressing emerging issues in travel and tourism:
 - A. Eco-tourism or nature-based tourism
 - B. Heritage tourism
 - C. Agricultural tourism, i.e., farm tours/vacations, etc.
 - D. Cultural tourism

Future

I. Base programs are the major educational efforts central to the mission of CES and common to most Extension units. They are ongoing priority efforts. Tourism development is part of the CES base program "Community Resource and Economic Development" (CR&ED) --one of seven base programs within the CES.

In general, CES can carry out the following tourism development efforts under its **base** program of **CR&ED**:

A. Establish a **national tourism policy** for the Extension Service, supporting tourism as an **economic development** tool.

B. Develop a **core program** with instructional materials as Extension's national program in tourism and articulate that program to all Federal, State and local agencies and to each State Extension Director.

C. Collaborate with **other agencies** and **private enterprises** to host State and multi-state **educational** programs for tourism development.

D. Develop and/or compile a series of **tourism education materials** for Extension personnel.

E. Encourage each State to provide, at a minimum, the **core program** in tourism development.

II. National initiatives are CES' commitment to respond to important societal problems of broad national concern with additional resources and significantly increase effort to achieve a major impact on national priorities. The national initiatives are current or emerging major issues arising out of one or more components of base programs. These national initiative are "in the spotlight" for a period of time.

Specifically, the Tourism Design team of the CET initiative recommends that the CES provide tourism development programs to respond to the **National Initiative** "Communities in Economic Transition"--one of eight CES initiatives at present--as follows:

A. **Public awareness education.** Designed to help community leaders understand the nature and potential of tourism as an economic development strategy, including the costs and benefits associated with tourism development.

B. **Assessment education and technical assistance.** Designed to help community/area leaders assess the potential of their community/area to develop tourism as a part of the economic development plan.

C. **Planning and development education.** Designed to help the citizenry, community planners and decision makers organize and develop a tourism plan that is appropriate to the interest and resources of their community.

D. **Marketing education.** Designed to help local leaders develop marketing strategies to attract tourists to their attractions and services, including product development and market research.

E. **Leadership and management education and technical assistance.** Designed to prepare individuals and community leaders to assume a leadership role in managing their tourism organization, the local tourism industry and the initiation, enhancement and expansion of private enterprise.

F. **Demonstration programs.** Designed to develop models for tourism development in planning, data collection and marketing.

Implementation Strategies

There are several approaches open to the CES in implementing its tourism strategy. CES cannot do it alone--it will form partnerships with other agencies, at the federal, state and local levels and with all the actors involved in the tourism sector.

The efforts outlined in the preceding section on **base programming** and **national initiatives** will be conducted to the extent and intensity possible within existing resources.

CES could re-allocate existing resources to tourism and travel programs. It can also work with its traditional research partner--the Agricultural Experiment Station--and with other partners in universities, i.e., planning and sociology departments, to expand research programs needed to effectively address tourism industry needs.

With expanded resources, CES could:

- Establish **expert teams**. CES could develop regional support teams to work with State Specialists, 1890 community development (CD) contacts, territory and commonwealth CD leaders, CES Indian Reservation agents, area agents and/or county level staff to provide support for the 2,600 counties under 50,000 in population experiencing economic transition. One of the targeted areas for assistance would be Rural Tourism Development.
- Place at least one **tourism specialist** in every State. This would initiate the program in 18 States and strengthen it in the others. States which already have tourism specialists could provide training and retraining to other States and would be able to add specialized positions to their staffs.
- Provide educational and technical assistance to businesses, local tourism groups and State governments in developing the capacity of an attraction to market, and provide services, to **international travelers**. Seminars could include: information on cultural differences, hospitality training and other special programs in international marketing and the "new tourisms"--eco-tourism, agri-tourism, and cultural, ethnic and heritage tourism.
- Finally, the quality of service the CES delivers to the tourism industry ultimately depends on the knowledge base its personnel possess. Simply reassigning and hiring new people to the tourism development task will not be enough; they must also have the education to be effective and to be seen as credible by the people they serve. Hence, existing personnel must undergo significant **retraining** and new hires must have the personalities and educational backgrounds required to deliver tourism development educational and technical assistance programming.

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APPENDIX

A. Excerpts from the publication RECREATION AND TOURISM, Challenges and Opportunities for Cooperative Extension, Recreation and Tourism Task Force, 1978:

The Situation in Brief

The demand for recreational goods, facilities, and services will continue to grow, but during the next 25 years it will be tempered by energy scarcity and rising prices.

Most of the growth and development in natural resource-based recreation will occur in rural America, especially areas within weekend commuting distance of large population centers.

In many rural communities recreation and tourism may become, or continue to be, a viable growth industry and provide opportunities for an increasing number of jobs for rural residents.

Conflicts in allocation of natural resources between recreation and other uses will increase.

The provision of tourist or "hospitality" services will continue to be a function of private enterprises: individual entrepreneurs.

Local leaders and governing officials need assistance in making informed decisions about recreation and tourism as a component of total community development. While protecting the community and its resources, these leaders and officials need to know the relationship of benefits for the indigenous populations.

Technical assistance to meet the demands for "hometown" recreation facilities and services for all citizens--young, old, low income, high income, advantaged, and disadvantaged--is needed. The demands from such a heterogeneous population may be quite different--sometimes compatible, and sometimes incompatible.

Energy supplies may be a factor adding pressures for the development of recreation services within the local community.

The challenge to the Cooperative Extension Service is to assist in establishing goals and priorities for a sound program to provide opportunities for all.

IMPLICATIONS FOR EXTENSION

.....
 A National Workshop on Cooperative Extension's Role in Outdoor Recreation was held in 1967 at the University of Georgia. W.H. Bennett, director of the Utah Extension Service, made the following observation:

"With tremendous expansion in recreation comes opportunities, as well as problems...Extension will have the opportunity as well as the challenge to help individuals achieve self-fulfillment and find the rich, full life. Extension has done a good job in the past, but must do a better job in the future. Certainly no other education group in the country has a better team of resource people..."

R.P. Davison, director of the Vermont Extension Service, added:

"...For the Extension Service this means a whole new and expanding area of education and information...This discipline will become very important in Extension work in the future."

.....
 Historically, Extension has channeled its efforts toward improving the quality of life for all Americans.

.....
 If Extension is to respond to these issues, recreation and tourism programming need to become an integral part of Extension programs. Extension's commitment to recreation and tourism will be necessary.

Extension's programs should relate to the three client groups: Individuals and families as consumers, public and private suppliers, and community leaders.

(Note--Emphasis [**bold face** and italics] were retained from the original publication.)

B. Extension Committees**National Extension Travel and Tourism Advisory Committee**

Philip Alexander, District Extension Tourism Agent, Michigan
 Leon Chavous, 1890 Extension Program, South Carolina (now retired)
 Donald Holecek, Director, Travel, Tourism, and Recreation
 Resource Center, Michigan
 Barbara Koth, Extension Tourism Center, Minnesota
 Margaret Moore, Extension Resource Development Specialist,
 Louisiana
 Donald L. Nelson, National Program Leader, Tourism and
 Commercial Recreation, ES-USDA, Washington, DC
 Sue Sadowske, Chair of Committee, Director, Tourism Research
 and Resource Center, Wisconsin
 Dave Sharpe, Extension Community Development Specialist, Montana
 Ayse Somersan, Extension Committee on Organization and Policy
 Advisor, Wisconsin
 Robert Townsend, Extension Community and Rural Development
 Specialist, Vermont
 Glenn Weaver, State Extension Tourism Specialist, Missouri
 Allan Worms, State Specialist in Outdoor Recreation, Kentucky

Tourism Design Team, Communities in Economic Transition National Initiative

* Phil Alexander, Michigan
 John Bramell, Appalachian Regional Commission, Washington, DC
 Tom Chesnutt, Extension Tourism Specialist, Alabama
 Marion Clarke, Marine Advisory Program, Florida
 Randy Dilliot, Clayton, Georgia
 Bill Gartner, Tourism Center, Minnesota
 Michael Hedges, Extension Community and Resource Development,
 Arkansas
 Brian Hill, Tourism Resource Center, Nebraska
 Todd Landfried, ES-USDA, Washington, DC
 Rhonda Lunsford, Clayton, Georgia
 * Donald L. Nelson, Washington, DC
 Thomas Potts, Extension Tourism Specialist, South Carolina
 * Sue Sadowske, Wisconsin
 Gale Trussell, Tennessee Valley Authority, Knoxville, TN
 * Glenn Weaver, Chair of Committee, Missouri
 Randy Williams, ES-USDA, Washington, DC
 Mike Woods, Extension Community and Resource Development,
 Oklahoma
 * Allan Worms, Kentucky
 * Also member of Advisory Committee

C. Reviewers of this Paper

The following persons reviewed this paper. Their suggestions were all good, though there was no clear pattern to them. Because of time and space limitations, not every suggestion was incorporated, but will be considered at a future date. Most said "great job," or words to that effect.

Their reviews are deeply appreciated by the National Extension Travel and Tourism Advisory Committee.

John Burbank, ND
Sally Carpenter, MI
Marion Clarke, FL
Bob Espeseth, IL
Daniel Fesenmaier, IL
George Goldman, CA
Dottie Heise, RIC-USDA
Diane Kuehn, NY
Leroy Hushak, OH
Dan Kuennen, DE
Kathleen DeMarco, NY
Greg Passewitz, OH
James Preston, MO
Robert Tervola, FL
Rudolph Schnabel, AZ
Ed Smith, OH
Gail Vander Stoep, MI
Gale Trussell, TVA
Donald Warder, WY
Mike Woods, OK

Mr. DURBIN. Two of our colleagues could not be here today, but would like some questions answered for the record.

[The questions and responses follow:]

BUDGET REDUCTION

Mr. PASTOR. How does Extension Service plan to accommodate the \$3.5 million reduction to its FY 95 budget proposal?

Response. The \$3.5 million reduction results from a one-time supplemental of \$1.4 million in FY 1994 and decrease in the AgrAbility program and Rural Technology Grant program. The Rural Technology Grant will be conducted by the Rural Development Administration and the AgrAbility project will most likely be continued from non-Federal resources.

INTEGRATED PEST MANAGEMENT

Mr. PASTOR. I support your interest in initiatives directed at reducing our use of pesticides. The integrated pest management program is important and I am pleased to see your budget proposal reflect an increase for this program. Could you describe your work in this area?

Response. The increase requested for integrated pest management (IPM) will provide the Cooperative Extension System with the capacity to develop a national core program on the use of intensive biological pest management strategies and to continue to bring additional resources for other IPM technologies to decrease the use of pesticides.

URBAN PROGRAMS

Mr. WALSH. Although many people are unaware of it, the Cooperative Extension Service (your agency) is involved in many programs that benefit urban areas. Could you comment on some of the urban programs that you are involved with? What public relations efforts are being made to get the word out to urban legislators about your programs?

Response. Some of the urban programs include community issues such as family concerns and health concerns. These concerns include the needs of food and nutrition, leadership, waste management and education. Other needs that are addressed in the urban setting are water quality, youth issues, environmental issues, urban horticulture and urban gardening.

FARM SAFETY

Mr. WALSH. I see in your budget request that you are calling for a cut in Farm Safety research. This is an important area of interest to me as I have had personal involvement with individuals involved in farm safety accidents. Can you please tell me what research your agency has done on this subject? What is the rationale for the reduction in your request?

Response. Actually, the Farm Safety education program has not been reduced. Extension will still be providing funds for farm safety specialists in all States. The cut of \$2 million reflects the elimination of the AgrAbility program, which was incorporated in to the Farm Safety line item. The AgrAbility projects, focusing on assisting disabled farmers to continue operation have been successful and should be continued through the use of non-Federal resources.

AQUATIC FOOD SAFETY/PATHOGENS

Mr. PASTOR. I am also interested in seeing your proposal to increase and expand aquatic food safety and foodborne pathogens. Could you describe these efforts in more detail? Also, what could you tell me about extension's role in the preharvest pathogen reduction efforts?

Response. First, the Cooperative Extension System (CES) is working in collaboration with national aquaculture associations to develop and implement producer-based quality assurance programs aimed at maintaining the high quality and safety of farm-raised aquatic foods. Support for these efforts is also from the USDA-funded Regional Aquaculture Centers that directs funding at high priority industry issues utilizing a team-building approach with industry, research and extension.

The Food Safety and Quality Initiative is supporting educational programs that are directed at producer-based Quality Assurance Programs that include fact sheets, a slide series, a video and a national aquaculture quality assurance video teleconference scheduled for May 1994.

The Food Safety and Quality Initiative is also funding development of HACCP implementation manuals for catfish and oyster processors that will provide guidance in complying with any federal mandatory seafood inspection regulation. These model programs can also be adopted to other finfish and shellfish processors.

The CES is also a partner in a national "Seafood Hazard Analysis and Critical Control Point (HACCP) Alliance" of federal and state agencies, universities, and the seafood industry. This Alliance is being launched by the National Sea Grant Program, with the support and assistance of the Association of Food and Drug Officials (AFDO) and the Association of Food and Drug Officials of the Southern States (AFDOSS). The goal of the Alliance is to increase the safety and quality of seafood produced, imported, processed and consumed in the U.S. through a nationally focused HACCP training and education program.

Secondly, at this point in time the ability of the CES to play a major role in preharvest food safety through pathogen reduction is limited. This limited ability is due to a lack of research data regarding the scope of the problem, rapid tests for microorganisms of concern, and methods of controlling or eliminating infection and re-infection.

Research results so far have indicated improved methods and practices can eliminate Salmonella in poultry operations. Currently, we are in the process of validating and demonstrating cost effective methods of eliminating Salmonella from broiler operations in Maryland. The results of this effort will serve as a basis to expand the program to other States.

Research is not currently available to serve as the foundation for validation and demonstration projects related to other livestock species and other microorganisms. As research is available, Extension can conduct the necessary validation demonstration work to document the methods and practices proposed will indeed reduce, eliminate or prevent reinfection by pathogenic microorganisms. This knowledge will then be incorporated into the existing quality assurance programs for the beef, dairy and swine production systems in the U.S. Extension works closely with producer groups and other government agencies at the federal, State and local level to implement these impact-oriented programs in quality assurance.

Mr. DURBIN. Thank you, Dr. Williams, and your panel. We will be taking a look at your agency and will be back in touch with you.

Dr. WILLIAMS. Thank you.

Mr. DURBIN. The meeting of the subcommittee will be adjourned for today.

BIOGRAPHICAL SKETCH
OF
DR. LEODREY WILLIAMS

Dr. Leodrey Williams was appointed Acting Administrator of the U.S. Department of Agriculture's Extension Service on September 11, 1993.

Prior to this Williams was appointed Assistant to the Administrator at the Extension Service in Washington, D.C., to strengthen the partnership between the 1890 and 1862 land-grant institutions. From 1980 through April 1993 he served as Administrator of the 1890 Cooperative Extension Program at Southern University in Baton Rouge, Louisiana.

Williams has also served on several national committees, including the Extension Committee on Organization and Policy (ECOP), USDA's Joint Council on Food and Agriculture Sciences, and the ECOP Personnel and Organization Development Committee.

He has served as a consultant in Extension administration and education in Sierra Leone and Ethiopia with the U.S. Agency for International Development. He was an adjunct professor in the Department of Extension and International Education at Louisiana State University. Williams was also the coordinator for equal employment opportunity and civil rights and professor of Extension education, and served as an agent and agricultural specialists with the Louisiana Cooperative Extension Service.

Williams earned an undergraduate degree in vocational agriculture from Southern University in 1961. He received his masters and doctorate degrees from LSU in Extension education in 1970 and 1975 respectively.

He is a native of West Feliciana Parish in Louisiana, married to Janice Anderson Williams, and has three children: Christopher, Crystal, and Erica.

EXTENSION SERVICE

Statement of Dr. Leodrey Williams, Acting Administrator, Extension Service, before the House Appropriations Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies.

Mr. Chairman, and members of the Committee, I appreciate the opportunity to appear before you to discuss the status and programs of the Extension Service and the ongoing cooperative partnership with the Land-Grant Universities and local Extension offices nationwide that comprise the Cooperative Extension System. Unlike my immediate predecessor, who came before you last year at this time with 7 years on the job as Administrator, I have just 7 months on the job. However, I do have over 30 years of service to the Extension System. My Extension career spans from being an agent and agriculture specialist in Louisiana to being Administrator of the Cooperative Extension program at Southern University in Baton Rouge, before coming to Extension Service at the Department of Agriculture last year.

Mr. Chairman, the mission of the Extension Service has been presented to this Committee on many occasions. It has not changed. Extension's mission is to help the American people improve their lives through an educational process that uses the research and scientific knowledge of the Land-Grant University, Federal laboratories and the private sector in focusing on critical issues and needs. The expertise and resources of Federal, state, and local governments are combined to accomplish this

mission and the Extension System is constantly changing to meet the shifting needs and priorities of the people it serves.

The organization of the Extension educational network is a unique partnership of the Extension Service at the Department of Agriculture, Extension professionals at the land-grant universities throughout the United States and its territories, Extension agents in nearly all of the Nation's 3,100 counties, paraprofessionals, and nearly 3 million volunteers that support and magnify the impact of Extension education.

CURRENT STATUS OF SYSTEM

I am pleased to report that the System remains strong, dynamic and focused on its mission to serve the American people. The Federal appropriations continue to leverage and generate resources at the state and local levels. In FY 1993, the \$425 million Federal dollars for Extension programs was augmented by \$626 million from the State partners, \$247 million from local entities, and over \$70 million from the private sector. Totalling over \$1.3 billion, these resources allow Extension education to reach well over 100 million Americans from the urban center to the rural setting.

Within these resources the Cooperative Extension System continues to redirect and change to meet emerging issues and unanticipated needs, such as the natural disasters that have occurred this past year.

Extension has responded to all of the recent events that have caused havoc and tragedy throughout the nation, such as; the E. coli food poisoning breakout in the Pacific Northwest, the fires and earthquakes in California, the drought of the Southeast, and the devastating Midwest Flood that still affects a major portion of the country. Extension was "on-site" in responding these events. Extension staff at all levels provided access to the latest disaster information, coordinating efforts with many public and private agencies. ES-USDA implemented a "flood crisis locator" database on its information delivery system. County agents transmitted information on everything from food safety, water quality, handling pesticides, stress management, and small business assistance, to filling out insurance forms.

I am proud of the job the Extension System has done in responding to these tragedies and I think the Congress should be commended for providing the support which allows the Extension System to remain viable and able to react to needs of this country.

FY 1995 BUDGET

Mr Chairman the Fiscal Year 1995 Budget Proposal submitted to the Congress by the President requests \$432,441,000 for Extension Service. This is a \$3.5 million decrease from the current appropriations. The Request provides for the Base Extension programs of Smith-Lever formula funds, funding for the 1890 Institutions and the D. C. Extension program at current fiscal year levels. The Rural Technology Grants, AgrAbility projects and specific earmarked projects are proposed for elimination. Adjustments in the administrative operations are proposed to meet the

goals of the Administration in making the Federal government more streamlined and efficient, as well as to reflect the savings to be achieved by implementing of the Secretary of Agriculture's reorganization plan. Areas of emphasis and increase requested in the Budget Proposal address some of the most critical issues facing us today and reflect a strong commitment from the Administration, in a time of extremely tight budget constraints, to provide additional resources for these programs.

A \$2 million dollar increase is requested for the Integrated Pest Management Program. Pesticide use in agriculture and throughout the environment continues to be a major issue. The FY 1995 emphasis for the IPM program will be to minimize the impact of agriculture on the environment by reducing pesticide applications; help maintain the profitability and international competitiveness of U. S. Agriculture; and educate urban residents and pest control professionals about IPM strategies.

Extension Pesticide Coordinators nationwide are faced with an increasing demand for training and education materials. Today's agriculture producers and urban pesticide applicators are faced with almost daily regulatory impacts on pesticides and their uses. The \$2 million request to establish a Pesticide Applicator Training program within the Extension budget will expand existing programs to serve the increasing number of pesticide users and the number of restricted use pesticides. Educational materials will be developed on a regional and national perspective regarding the application of pesticides.

Congress provided specific funding for Sustainable Agriculture programs within the FY 1994 Extension appropriation. Those funds are being used to address the Extension activities outlined in Chapter 3 of Subtitle B of the 1990 FACT Act, regarding the training of cooperative Extension agents and other professionals involved in sustainable agriculture. The \$2 million increase proposed in FY 1995 will provide resources to address the Extension activities of Chapter 2 of the same Subtitle, regarding integrated management systems. Funds will be used on a project proposal merit-basis to develop comprehensive decision support systems based on information from ongoing research and to conduct demonstration projects to illustrate how technologies, practices and production systems can be integrated into existing systems.

The recently developed Food Safety and Inspection Service Pathogen Reduction Program recognizes Extension's role in pre-harvest pathogen reduction and the education of food handlers and consumers. The \$1 million requested increase will expand Extension's efforts to address current issues such as aquatic food safety and foodborne pathogens. Continued support will be given to the enhancement of the Food and Animal Residue Avoidance Databank (FARAD), and the interagency cooperation on applied research and education pilot programs across the food chain.

An increase of \$250,000 is also requested to expand the Rural Health and Safety project being conducted in Mississippi. This project, done in collaboration with the Mississippi Extension Service and the Community Colleges of the state has been

tremendously successful in training rural health care professionals to provides services to the public.

This concludes my remarks, Mr. Chairman. I will be happy to respond to any questions from the Committee.

EXTENSION SERVICE

Purpose Statement

The Cooperative Extension System, a national educational network, is a dynamic organization pledged to meeting the country's needs for research, knowledge and educational programs that will enable people to make practical decisions. Its mission is to help people improve their lives through an educational process that uses scientific knowledge focused on issues and needs. Cooperative Extension work was established by the Smith-Lever Act of May 8, 1914, as amended. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977, as amended.

To accomplish its mission, the Cooperative Extension System is constantly changing to meet the shifting needs and priorities of the people it serves. As peoples' needs and priorities change, program priorities, organizational structures, and external relationships must also change. To fulfill the requirements of the Smith-Lever Act, the Cooperative Extension Service in each state, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, the Northern Marianas and Micronesia, conduct educational programs to improve American agriculture and strengthen the Nation's families and communities.

This public funded, nonformal educational network combines the expertise and resources of Federal, state and local governments. The partners in this unique System are:

- o The Extension Service of the U.S. Department of Agriculture (USDA);
- o Extension professionals at land-grant universities throughout the United States and its territories; and
- o Extension professionals in nearly all of the Nation's 3,150 counties.

Thousands of paraprofessionals and nearly 3 million volunteers support this partnership and magnify its impact. Strong linkages with both public and private external groups are also crucial to the Extension System's strength and vitality.

The Extension Service, USDA, provides national leadership and represents the U.S. Department of Agriculture within the Cooperative Extension System, comprised of some 31,000 state and local Extension System employees and 2.9 million program service volunteers. As of September 30, 1993, there were 190 full-time permanent employees and 15 other than full-time permanent Extension Service-USDA employees, all located in the D.C. metropolitan area.

Under the proposed reorganization, this agency will be merged into the newly established Agricultural Research and Education Service.

EXTENSION SERVICE

Available Funds and Staff-Years

1993 Actual and Estimated, 1994 and 1995

Item	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Extension Service.....	\$428,428,785	180	\$434,582,000	180	\$432,441,000	170
<u>Obligations under Other USDA</u>						
<u>Appropriations:</u>						
Agricultural Marketing Service -						
Pesticide Educational Materials.....	300,000		300,000		300,000	
Agricultural Stabilization and						
Conservation Service -						
Administrative Support.....	7,680		10,000		10,000	
Colorado River Salinity.....	618,400		620,000		620,000	
Options Pilot Programs.....	75,870		80,000		80,000	
Rural Clean Water Project.....	262,186		250,000		250,000	
Agricultural Research Service -						
Integrated Pest Mgmt. Newsletter....	5,000		--		--	
Producers Views/WQ Measures.....	40,000		--		--	
Study: Cert Crop Advisor Prog.	12,000		--		--	
Study: Changing the Amer Diet.....	10,000		--		--	
Study: Manuf/Industr Ext Models.....	60,000		--		--	
Study: S&E Research & Ext Prog. ...	70,000		--		--	
Support Services.....	14,513		16,000		16,000	
Alternative Agriculture Research and						
Commercialization -						
Administrative Support.....	21,827		30,000		30,000	
Cooperative State Research Service -						
PLANETOR--Microcomputers.....	80,000		40,000		40,000	
Internet Connection.....	10,000		50,000		50,000	
Sustainable Agriculture/Qual Life....	70,000		70,000		70,000	
Economic Research Service -						
Water Quality Measures Project.....	30,000		--		--	
Federal Crop Insurance Corporation -						
Educational Programs.....	380,385		350,000		350,000	
Food Safety & Inspection Service -						
Nutrition Labeling & Education.....	4,000		--		--	
Forest Service -						
FS Prognosis Project.....	22,865		--		--	
Office of International Cooperation and						
Development -						
Citizen Ambassador Program.....	2,500		--		--	
Rural Development Administration-						
Develop Models for Business Dev. ..	3,025,000		--		--	
Soil Conservation Service -						
Farm Assessment System.....	75,000		70,000		70,000	
National Composting Conference.....	5,000		--		--	
Total, Other USDA Appropriations	5,202,226		1,886,000	--	1,886,000	
Total, Agriculture Appropriations	433,631,011	180	436,468,000	180	434,327,000	170

Item	1993 Actual	Staff- Years	1994 Estimated	Staff- Years	1995 Estimated	Staff- Years
	Amount		Amount		Amount	
<u>Other Federal Funds:</u>						
Reimbursements:						
AID-PASA International Extension -	3,747,161		10,730,000		12,550,000	
Commission on Nat'l and Community Service -						
Youth Service Programming.....	100,000		100,000		100,000	
Department of Defense -						
Family Life Enrichment.....	2,390,564		1,900,000		2,800,000	
Department of Health and Human Services -						
Decision for Health Initiative Team....	25,000		25,000		25,000	
Department of Interior -						
Fish & Wildlife Educational Prog.	7,176		10,000		10,000	
Environmental Protection Agency -						
ES Liaison - Water Quality.....	40,000		50,000		50,000	
Farm Assessment System.....	80,000		90,000		90,000	
N.Y. Sea Grant Extension Project.....	33,300		34,000		34,000	
Pesticide Applicator Training.....	1,742,889		2,740,000		--	
Pesticide Safety Material.....	100,000		100,000		100,000	
Technical Assistance to EPA.....	46,500		10,000		30,000	
Total, Other Federal Funds	8,312,590		15,789,000		15,789,000	
<u>Non-Federal Funds:</u>						
Univ. of Wisconsin Extension -			--		--	
NELD Program.....	13,500					
Annie E. Casey Foundation -						
Educational Programs.....	--		75,000		75,000	
Federal Building Funds.....	49,493		100,000		100,000	
Federal Telecommunications System...	2,800		10,000		10,000	
Cost Share Printing.....	100,000		100,000		100,000	
Computerized Information Delivery System.....	24,000		40,000		40,000	
Total, Non-Federal Funds	189,793		325,000		325,000	
Total, Extension Service	442,133,394	180	452,582,000	180	450,441,000	170

EXTENSION SERVICE

Permanent Positions by Grade and Staff Summary
1993 and Estimated 1994 and 1995

GRADE	1993	1994 Est.	1995 Est. <u>1/</u>
ES-6	1	1	1
ES-5	1	1	1
ES-4	4	4	4
ES-3	2	2	2
ES-2	1	1	1
GS/GM-15	32	32	32
GS/GM-14	37	37	36
GS/GM-13	10	10	11,
GS-12	11	11	11
GS-11	10	10	10
GS-10	1	1	1
GS-09	9	9	9
GS-08	7	7	7
GS-07	13	13	13
GS-06	24	24	24
GS-05	12	12	12
GS-04	15	15	15
GS-03	3	3	3
Other Graded Positions	0	0	0
Ungraded Positions	0	0	0
Total, Permanent positions	193	193	193
Unfilled positions End of Year	0	0	0
Total Permanent Employment End of Year	193	193	193
Staff Years:			
Ceiling	180	180	170

1/ Numbers of positions and grade levels are distributed on a pro-rata basis to meet the goals of the ARES realignment.

EXTENSION SERVICE

CLASSIFICATION BY OBJECTS1993 And Estimated 1994 and 1995

Personnel Compensation:	<u>1993</u>	<u>1994</u>	<u>1995</u>
Headquarters.....	\$10,488,109	\$10,905,000	\$10,947,000
Field.....	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
11 Total Personnel Compensation.....	10,488,109	10,905,000	10,947,000
12 Personnel Benefits.....	<u>2,295,312</u>	<u>2,386,000</u>	<u>2,402,000</u>
Total Pers. Comp. & Benefits.....	12,783,421	13,291,000	13,349,000
Other Objects:			
21 Travel.....	916,588	954,000	950,000
22 Transportation of things.....	47,216	50,000	50,000
23.2 Communications, utilities & other rent.....	752,595	782,000	780,000
24 Printing & reproduction.....	415,333	433,000	430,000
25 Other services.....	1,495,266	1,557,000	1,489,000
26 Supplies & materials.....	336,200	348,000	340,000
31 Equipment.....	319,151	332,000	330,000
41 Grants, subsidies & contributions.	411,821,015	417,085,000	414,723,000
Total other objects.....	<u>416,103,364</u>	<u>421,541,000</u>	<u>419,092,000</u>
Total direct obligations.....	<u>428,886,785</u>	<u>434,832,000</u>	<u>432,441,000</u>
<u>Position Data:</u>			
Average Salary, ES positions.....	\$108,657	\$110,000	\$112,000
Salary, GM/GS positions.....	\$ 50,232	\$ 51,000	\$ 53,000
Average Grade, GM/GS positions.....	9.99	9.99	9.99

EXTENSION SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Payments to States, the District of Columbia, Puerto Rico, Guam, the Virgin Islands, Micronesia, Northern Marianas, and American Samoa: For payments for cooperative [agricultural] extension work under the Smith-Lever Act, as amended, to be distributed under sections 3(b) and 3(c) of said Act, and under section 208 (c) of Public Law 93-471, for retirement and employees' compensation costs for extension agents and for costs of penalty mail for cooperative extension agents and State extension directors, \$272,582,000; payments for the nutrition and family education program for low-income areas under section 3(d) of the Act, \$61,431,000; payments for the pest management program under section 3(d) of the Act, [\$8,459,000;] \$10,459,000; payments for the farm safety [and rural health] program under section 3(d) of the Act, [\$2,988,000;] \$988,000; payments for the pesticide impact assessment program under section 3(d) of the Act, \$3,363,000; payments to upgrade 1890 land-grant college research and extension facilities as authorized by section 1447 of Public Law 95-113, as amended (7 U.S.C. 3222), \$7,901,000, to remain available until expended; payments for the rural development centers under section 3(d) of the Act, \$950,000; payments for a ground-water quality program under section 3(d) of the Act, \$11,234,000; payments for the Agricultural Telecommunications Program, as authorized by Public Law 101-624 (7 U.S.C. 5926), \$1,221,000; payments for youth-at-risk programs under section 3(d) of the Act, \$10,000,000; payments for a Nutrition Education Initiative under section 3(d) of the Act, \$4,265,000; payments for a food safety program under section 3(d) of the Act, [\$1,975,000;] \$2,975,000; payments for a Pesticide Applicator Training program under Section 3(d) of the Act, \$2,000,000; payments for carrying out the provisions of the Renewable Resources Extension Act of 1978, \$3,341,000; payments for Indian Reservation Extension agents under section 3(d) of the Act, \$1,750,000; [payments to establish and operate centers of rural technology development as authorized by section 2347 of Public Law 101-624 (7 U.S.C. 1932), \$1,500,000]; payments for sustainable agriculture programs under section 3(d) of the Act, [\$2,963,000;] \$4,963,000; payments for rural health and safety education as authorized by section 2390 of Public Law 101-624 (7 U.S.C. 2661 note, 2662), [\$2,000,000;] \$2,250,000; and payments for extension work by the colleges receiving the benefits of the second Morrill Act (7 U.S.C. 321-326, 328) and Tuskegee University \$25,472,000; in all, [\$423,395,000;] \$427,145,000. Provided, That funds hereby appropriated pursuant to section 3(c) of the Act of June 26, 1953, and section 506 of the Act of June 23, 1972, as amended, shall not be paid to any State, District of Columbia, Puerto Rico, Guam, or the Virgin Islands, Micronesia, Northern Marianas, and American Samoa prior to availability of an equal sum from non-Federal sources for expenditure during the current fiscal year.

Federal administration and coordination: For administration of the Smith-Lever Act, as amended, and the Act of September 29, 1977 (7 U.S.C. 341-349), as amended, and section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.), and to coordinate and provide program leadership for the extension work of the Department and the several States and insular possessions, [\$11,187,000] \$5,296,000. (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 1994).

The change is for the purpose of providing funding for a pesticide applicator training program under Section 3(d) of the Act.

EXTENSION SERVICE

Appropriations Act, 1994	\$434,582,000
Budget Estimate, 1995	<u>432,441,000</u>
Decrease in Appropriations	<u>2,141,000</u>

SUMMARY OF INCREASES AND DECREASES
(On Basis of Appropriation)
Dollars in Thousands

Item of Change	1994 Estimated	Pay Costs	Other Changes	1995 Estimated
Base Programs:				
Smith-Lever 3b&c	\$271,557	- -	- -	\$271,557
1890's and Tuskegee University	25,472	- -	- -	25,472
D.C. Extension	1,025	- -	- -	1,025
Earmarked Programs and National Initiatives:				
EFNEP	61,431	- -	- -	61,431
Integrated Pest Management	8,459	- -	+ \$2,000	10,459
Pesticide Impact Assessment	3,363	- -	- -	3,363
Farm Safety	2,988	- -	-2,000	988
Rural Development Centers	950	- -	- -	950
Water Quality	11,234	- -	- -	11,234
Pesticide Applicator Training	- -	- -	+ 2,000	2,000
Youth & Families at Risk	10,000	- -	- -	10,000
Food Safety	1,975	- -	+ 1,000	2,975
Indian Reservation Ext. Agents	1,750	- -	- -	1,750
Sustainable Agriculture	2,963	- -	+ 2,000	4,963
Nutrition Education Initiative	4,265	- -	- -	4,265
Agriculture Telecommunications	1,221	- -	- -	1,221
Renewable Resources Extension Act	3,341	- -	- -	3,341
Rural Technology Grants	1,500	- -	-1,500	0
Rural Health/Safety	2,000	- -	+ 250	2,250
Program Support:				
1890 Facilities (Sec. 1447)	7,901	- -	- -	7,901
Federal Administration:				
General Administration	5,534	+ 140	-378	5,296
Congressional Projects	5,653	- -	-5,653	0
Subtotal	11,187	+ 140	-6,031	5,296
Total Available	<u>434,582</u>	<u>+ 140</u>	<u>-2,281</u>	<u>432,441</u>

PROJECT STATEMENT
(On basis of available funds)

Project	1993 Actual		1994 Estimated		Increase or Decrease	1995 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Payments to States:							
Smith-Lever Act							
1. Section 3b&c:							
Program.....	\$256,044,520	--	\$264,535,720	--		\$264,535,720	--
Set-aside for Federal Administration (4%).....	6,667,480	--	7,021,280	--		7,021,280	--
Subtotal, Section 3b&c.....	262,712,000	--	271,557,000	--		271,557,000	--
2. Section 3d Program:							
EFNEP.....	60,525,000	--	61,431,000	--		61,431,000	--
Pest Management.....	8,200,000	--	8,459,000	--	¹ +2,000,000	10,459,000	--
Pesticide Impact Assessment.....	3,405,000	--	3,363,000	--		3,363,000	--
Urban Gardening.....	3,557,000	--	--	--		--	--
Farm Safety.....	2,720,000	--	2,988,000	--	² +2,000,000	988,000	--
Rural Development Centers....	950,000	--	950,000	--		950,000	--
Water Quality.....	11,375,000	--	11,234,000	--		11,234,000	--
Pesticide Applicator Training	--	--	--	--	³ +2,000,000	2,000,000	--
Youth and Families at Risk...	10,000,000	--	10,000,000	--		10,000,000	--
Food Safety.....	1,500,000	--	1,975,000	--	⁴ +1,000,000	2,975,000	--
Indian Reservations.....	1,750,000	--	1,750,000	--		1,750,000	--
Nutrition Education Initiative.	3,530,000	--	4,265,000	--		4,265,000	--
Sustainable Agriculture.....	--	--	2,963,000	--	⁵ +2,000,000	4,963,000	--
Subtotal, Section 3d.....	107,512,000	--	109,378,000	--	+5,000,000	114,378,000	--
Total, payments under the Smith-Lever Act.....	370,224,000	153	381,960,000	153	+5,000,000	385,935,000	145
Payments under Renewable Resources Extension Act.....	2,765,000	--	3,341,000	--	--	3,341,000	--
Payments to the District of Columbia:							
Program.....	969,600	1	984,000	1	--	984,000	--
Set-Aside for Federal Administration (4%).....	40,400	--	41,000	--	--	41,000	--
Total, payments to the District of Columbia.....	1,010,000	1	1,025,000	1	--	1,025,000	--

	1993 Actual		1994 Estimated		Increase or		1995 Estimated	
Project	Amount	Staff Years	Amount	Staff Years	Decrease	Amount	Staff Years	
Payments to 1890 Colleges and Tuskegee University:								
Program.....	23,740,800	1	24,453,120	1	-0-	24,453,120	1	
Set-aside for Federal Administration (4%).....	989,200	--	1,018,880	--	-0-	1,018,880	--	
Total, payments to 1890 Colleges and Tuskegee University.....	24,730,000	1	25,472,000	1	-0-	25,472,000	--	
Payments to Ag. Telecommunications.....	1,221,000	--	1,221,000	--	-0-	1,221,000	--	
Payments to Disadvantaged Farmers Assistance.....	2,550,000	--	--	--	-0-	--	--	
Payments to Rural Technology Grants.....	1,000,000	--	1,500,000	--	*1,500,000	--	--	
Payments to Socially Disadvantaged Farmers/Ranchers.....	1,000,000	--	--	--	-0-	--	--	
Payments to Rural Health/Safety.....	2,000,000	--	2,000,000	--	†250,000	2,250,000	--	
1890 Facilities (Sec. 1447).....	8,708,808	--	8,151,023	--	-0-	7,901,000	--	
3. Federal Administration and Coordination (Direct Appropriation):								
General Admin.....	5,149,977	25	5,534,000	25	-238,000	5,296,000	23	
Congress. Projects.....	5,028,000	--	5,653,000	--	-5,653,000	--	--	
Sub-Total.....	10,177,977	--	11,187,000	--	*5,891,000	5,296,000	--	
Flood Relief Supplemental.....	3,500,000	--	--	--	--	--	--	
Program Set-Asides (non-add).....	(3,033,904)	--	(2,841,910)	--	--	(3,051,910)	--	
Total Available.....	428,886,785	180	434,832,023	180	--	--	--	
Unobligated Balance, Start of Year.....	-708,808	--	-250,023	--	--	--	--	
Unobligated Balance, End of Year.....	250,023	--	--	--	--	--	--	
Total Appropriation.....	428,428,785	180	434,582,000	180	-2,141,000	432,441,000	170	

NOTE: A supplemental of \$1.4 million has been proposed for fiscal year 1994 to help develop and demonstrate techniques to reduce the spread of Late Blight Fungus of potatoes through improved farm management of cull potatoes.

EXPLANATION OF PROGRAM

The Cooperative Extension System, a national network, is a dynamic organization pledged to meeting the country's needs for research-based educational programs that will enable people to make practical decisions to improve their lives. To accomplish its mission, the Cooperative Extension System adjusts programs to meet the shifting needs and priorities of the people it serves.

This nonformal educational network combines the expertise and resources of federal, state, and local governments. The partners in this unique System are: (a) The Extension Service at the U.S. Department of Agriculture, (b) Extension professionals at land-grant universities throughout the United States and its territories; and (c) Extension professionals in nearly all of the Nation's 3,150 counties.

Thousands of paraprofessionals and nearly 3 million volunteers support this partnership and magnify its impact. Strong linkages with both public and private external groups are also part of the Extension System.

Base Programs are the major educational efforts central to the mission of the System and common to most Extension units. They are the ongoing priority efforts of the System, involving many discipline-based and multi-disciplinary programs. The system's base programs are the foundation of the Extension organization.

National initiatives are the system's commitment to respond to important societal problems of broad national concern with additional resources and significantly increased effort to achieve a major impact on national priorities. They are the current most significant and complex issues on which the Extension System has the potential to make a difference-- usually in cooperation with other agencies, groups and units of government.

Extension funds are provided to the States through formula grants and competitively awarded programs. Smith-Lever 3b and 3c funds and payments to the 1890 colleges and Tuskegee University provide funds to support the Extension infrastructure. Funds for designated programs provide support for the System to address identified priority issues.

Initiatives proposed in 1995 include funding for: sustainable agriculture education programs; expansion of food safety activities; increased efforts on pest management; support for a Pesticide Applicator Training program, and enhancement of the Rural Health Project in Mississippi.

JUSTIFICATION OF INCREASE/DECREASE

- (1) An increase of \$2,000,000 for the Integrated Pest Management Program. (\$8,459,000 million available for FY 1994).

Need for Change. During the past two decades, the Cooperative Extension System (CES) has established strong Integrated Pest Management (IPM) programs in each State and territory of the United States. Every CES IPM program strives to educate users of pesticides about the economic and environmental benefits of an IPM approach to pest management. The goals of these programs are to 1) minimize the impact of agriculture on the environment, and 2) maintain the profitability and international competitiveness of U.S. agriculture. The critical issues of water quality, endangered species, food safety, and farm worker safety are important elements of CES IPM programs. CES programs also educate homeowners and urban pest control professionals about IPM strategies for the lawn, garden, home and commercial structures.

Environmental and economic pressures have increased the incentives for U.S. agricultural producers to adopt IPM strategies. Increasingly, U.S. agriculture is moving towards the use of more complex "biologically intensive" IPM strategies that rely heavily on biological control organisms and other non-chemical management alternatives. However, CES cannot currently provide the intensive educational programs that are needed to increase adoption of biologically intensive IPM strategies.

It is essential that CES begin training the IPM personnel that are needed to implement these systems. We are on the threshold of a new era in pest management systems. However, the promise of biologically intensive pest management technologies will not be realized without the concurrent development of a strong extension education system capable of transferring these technologies to agricultural producers and other end-users. CES must improve its capability to provide the IPM extension education programs that are needed to successfully implement biologically intensive IPM strategies and to realize our goal of a sustainable agricultural industry in the United States.

Nature of Change. Federal support for CES IPM programs is more important now than ever before. Agricultural and urban users of pesticides must be educated about environmentally-sound pesticide use and learn how to manage pests with non-chemical alternatives. Increased fiscal 1995 funding will permit CES to:

- o Increase IPM educational programs that focus on the reduction or elimination of unnecessary pesticide applications to fruits, vegetables, and field crops. Develop and apply IPM methods to address new and emerging pest and disease threats such as Late Blight fungus on potatoes.
- o Increase incorporation of biological control, host resistance, cultural management techniques into IPM education programs.
- o Develop a core national training program to educate private crop consultants, agri-chemical and fertilizer dealers, elevator operators, state and county extension staff, staff from other government agencies, and agricultural producers about biologically intensive IPM principles and strategies.
- o Develop new IPM delivery techniques that will improve the capability of CES staff to educate U.S. agricultural producers and urban residents about IPM strategies.
- o Conduct national evaluations that document the economic and environmental benefits of IPM so that this information can be used to demonstrate the advantages of IPM to U.S. agricultural producers.
- o Increase urban IPM programs that educate homeowners, commercial turf and ornamental pest control operators, institutional managers responsible for turf and

ornamental pest management, and commercial growers and dealers of turf and ornamental plants about IPM strategies.

This requested IPM funding increase will be distributed to States and Territories by formula (+\$1.750 million) and competitively through projects (+250,000) that address issues of greatest regional and national concern. The funding of the six territories will be increased \$20,000 annually. The remaining increase will be divided equally among the fifty states.

- (2) A decrease of \$2,000,000 for the Farm Safety and Rural Health program under Section 3(d) of the Smith-Lever Act. (\$2,988,000 available in FY 1994).

Need for Change. Emergency care and response is an important rural health concern. Most rural and farm family members are not sure of procedures to follow if they arrive first on a farm accident scene. Many victims are discovered by family members or farm workers who must be able to act quickly and effectively to save the victim without injuring themselves. There are numerous farm accident situations which emergency medical or rescue personnel may confront with little prior experience or training. Many of these situations can readily become hazardous to the rescuer. Cases have occurred in which emergency personnel have been injured or killed while attempting to carry out a rescue or provide treatment to an injured person on a farm.

Nature of Change. Funding for the AgriAbility project is not being requested. The focus of the Farm Safety program will be shifted to providing funds for project proposals in targeted farm safety programs, with the objective of limiting exposure to occupational hazards and for awarding project proposals to train emergency rescue professionals in farm accident extrication procedures and educate nonprofessionals in first-on-the-scene emergency response procedures. These programs are crucial to reducing the risk of injury to the rescuer, reducing the severity of the injury to the accident victim, and reinforcing the value of accident prevention.

- (3) An increase of \$2,000,000 for the Pesticide Applicator Training program. (No funds available in FY 1994).

Need for Change. The Pesticide Applicator Training (PAT) program offers an opportunity for Extension to reach non-traditional as well as traditional audiences. It also affects partnerships in the truest sense, building coalitions with federal and state agencies and serving diverse clientele ranging from individual producers and applicators to agricultural service organizations and commodity groups. Training of pesticide applicators transcends typical programs; it has an active and supportive clientele from urban and rural audiences. PAT complements the Integrated Pest Management program. With an increase in the number of pesticide users requiring training and certification to use restricted use pesticides and more regulatory action at both the state and federal level the need to support training is ever more apparent.

The Pesticide Applicator Training program functions not only to train applicators but also serves to inform clientele on related regulatory concerns such as groundwater, endangered species, and worker protection. It has functioned well on the national level and offers a base from which to build related programs.

Today's agricultural producer and urban pesticide applicator/user is faced with almost daily regulatory impacts on pesticides and their uses. It is imperative that Extension, through the Pesticide Applicator Training program provide that impartial base for information and training. Pesticide Coordinators nationwide are faced with an increasing demand for training and educational materials, as a result of increasing regulatory activities from both the federal and state levels.

Nature of Change. Additional funding will provide staffing support for Pesticide Applicator Training within the State Extension Services to develop educational materials from a regional and sometimes national perspective. Innovative delivery systems will be

demand for training and educational materials, as a result of increasing regulatory activities from both the federal and state levels.

Nature of Change. Additional funding will provide staffing support for Pesticide Applicator Training within the State Extension Services to develop educational materials from a regional and sometimes national perspective. Innovative delivery systems will be stressed, such as long distance education, auto-tutorial and train the trainer programs. Coordination with EPA will continue for special projects and program evaluations.

- (4) An increase of \$1,000,000 for Food Safety Programs under Section 3(d) of the Smith-Lever Act (\$1,975,000 available in FY 1994).

Need for Change. The Cooperative Extension System (CES) has historically had a food safety emphasis in educational programs across the food chain. For four years, Food Safety and Quality has been a specific high priority area for Extension. The recently developed FSIS-led Pathogen Reduction Program recognizes CES's role in education and has identified the Agency as a cooperator for achieving specific goals, especially in pre-harvest pathogen reduction programs and education of food handlers and consumers. This complements the current CES priority areas of minimizing risks of foodborne illness through improper handling; reducing foodborne hazards in production and processing environments; and increasing understanding of food-related risks and risk management.

Nature of Change. The increase is requested to allow additional work in support of the FSIS-led USDA Pathogen Reduction Program, especially in pre-harvest pathogen reduction and education of food handlers and consumers. Increased funds will be distributed through a project proposal process focused to:

- (1) Facilitate interagency cooperation on applied research and educational pilot programs across the food chain which address goals in the plan.
 - (2) Expand efforts to effectively address current issues such as aquatic food safety, E. coli and other foodborne pathogens.
 - (3) Develop, implement, and evaluate multidisciplinary, interagency programs in food handler training, risk management and public policy education, and quality management programs for producers and processors, such as HACCP or Total Quality Management (TQM).
 - (4) Support continuation and expansion of the Food Animal Residue Avoidance Databank.
- (5) An increase of \$2,000,000 for Sustainable Agriculture Systems under Section 3(d) of the Smith-Lever Act (\$2,963,000 available in FY 1994).

Need for Change. The U.S. agriculture sector faces major challenges in maintaining economic competitiveness while concurrently assuring responsiveness to growing societal concerns of agricultural production practices and the environment. The public and private sectors have supported research to improve economic competitiveness of the agriculture sector, develop alternate crops and new uses, and environment enhancing technologies, methods and practices. These investments have resulted in, and will continue to provide, improved technologies and production methods. The agriculture community and rural America need new environmentally sound technologies, new resource conserving crops and new uses, and production practices efficiently integrated into holistic farming and ranching systems. The goal of this effort is the successful integration of new environmentally sound technologies, new resource conserving crops and new uses into holistic farming and ranching systems. In order to achieve this objective, consistent with environmentally sound approaches and societal expectations, careful analysis, training of agricultural professionals and improved site specific decision-making must take place. This will require development of training programs, improved systems for efficient access to research results, decision support systems and validation applied research demonstrations.

Nature of the Change. Smith-Lever 3(d) funding for sustainable agriculture programs was initially provided in the FY 1994 Appropriations for Extension Service. Those funds were used to address the activities described in Chapter 3 of Subtitle B of the FACT Act of 1990 to provide education and training for Cooperative Extension Service agents and other professionals involved in the education and transfer of technical information concerning sustainable agriculture.

While the base funds of \$2.9 million will continue to go towards Chapter 3 activities, the increase of \$2.0 million is requested to address integrated management systems reflected in Chapter 2 of Subtitle B. Funds would be used to provide opportunities for the State Extension Services to illustrate specific technologies, practices, new crops and new uses and production systems integration into holistic farming and ranching operations. Efforts would be made to further develop comprehensive databases and decision support systems. Funds would be distributed on a project proposal merit basis.

- (6) A decrease of \$1,500,000 to eliminate funding in Rural Technology Grants. (\$1,500,000 available in FY 1994).

Need for Change. These grants are proposed for elimination. State and local governments and private sources could use non-Federal resources to continue high priority aspects of these projects.

Nature of Change. This proposal will eliminate specifically earmarked funding for Rural Technology Grants.

- (7) An increase of \$250,000 for the Rural Health and Safety Education Program under PL 101-624. (\$2,000,000 available in FY 1994).

Need for Change. Rural residents face numerous obstacles to maintaining their health status. A major concern is the shortage of health care professionals. This increase will enhance the ongoing rural health project in Mississippi focusing on training health care professionals in rural areas.

Nature of Change. The increased funds will expand the ongoing rural health and safety program in Mississippi to train health care professionals. The program is being conducted by the Cooperative Extension System and the Community Colleges within the State.

- (8) A net decrease of \$5,891,000 for Federal Administration and Coordination (direct line)
(\$11,187,000 available in FY 1994).

Project	1994	Inc/Dec	1995
Technology Transfer (OK/MS)....	\$ 331,000	-\$331,000	--
Rural Development (NE).....	400,000	-400,000	--
Rural Development (NM).....	230,000	-230,000	--
Rural Development (OK).....	300,000	-300,000	--
Chinch Bug/Russian Wheat			
Aphid (NE).....	67,000	-67,000	--
Cranberry Development (ME)....	50,000	-50,000	--
Rural Center/HIV (IN).....	250,000	-250,000	--
Satellite Downlink (PA).....	125,000	-125,000	--
Pilot Technology (WI).....	165,000	-165,000	--
Crop Simulation Projects (MS)...	498,000	-498,000	--
Rural Rehabilitation			
Projects (GA).....	250,000	-250,000	--
Presque Island (ME).....	187,000	-187,000	--
Income Enhancement (OH).....	250,000	-250,000	--
Beef Producers (AR).....	200,000	-200,000	--
Integrated Cow/Calf Mgmt. (IA)..	250,000	-250,000	--
Delta Teachers Academy	2,000,000	-2,000,000	--
Extension Specialist (AR).....	100,000	-100,000	--
Subtotal.....	5,653,000	-5,653,000	--
Base, Federal Administration.....	5,534,000	-250,000	5,284,000
Ag. In the Classroom.....	--	+208,000	208,000
Pay Raise.....	--	+140,000	140,000
Maintain Administrative			
Expenses.....	--	+59,000	59,000
Reduction in Staff Funding.....	--	-250,000	-250,000
Reduction in Administrative			
Overhead.....	--	-145,000	-145,000
TOTAL.....	<u>\$11,187,000</u>	<u>-\$5,891,000</u>	<u>\$5,296,000</u>

- (a) A decrease of \$5,653,000 for Special Projects (\$5,653,000 available in FY 1994).

Need for Change. These projects are proposed for elimination. Each of these earmarked special projects could be considered for financing within the priorities of the respective States.

Nature of Change. This proposal will eliminate earmarked funding support for these projects.

- (b) An increase of \$208,000 to provide for the transfer of the Agriculture in the Classroom program from the Cooperative State Research Service to the Extension Service.
- (c) An increase of \$140,000 for the FY 1995 pay raise.
- (d) A decrease of \$441,000 for a reduction in Federal employment costs.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order mandating a reduction in Federal employment, ES is reducing employment from the FY 1993 base by 5 percent.

Nature of Change. Streamlining of USDA's research and education programs will lead to program and administrative management efficiencies. These efficiencies provide an opportunity to reduce the staff year ceiling for Extension while continuing to provide National program planning and coordination in partnership with the States. Savings will be achieved through the planned consolidation of administrative and program planning staffs under the Agricultural Research and Education Service.

Consistent with government wide goals, there will be reductions at grades GS-14 and above and efforts will be made to reduce the ratio of supervisors to employees. To achieve the reduction, ES will streamline its operation. The total reduction in personnel costs amounts to \$191,000.

- (e) A decrease of \$145,000 for administrative efficiency.

Need for Change. In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$145,000.

Nature of Change. In order to achieve these savings, ES will reduce discretionary expenses by \$145,000 in FY 1995, in areas such as travel, supplies and equipment.

EXTENSION SERVICE
Geographic Breakdown of Obligations
1993 and Estimated 1994 and 1995
(Amount in 000s)

State/Territory	FY 1993 Actual Obligations	Estimated Obligations	
		FY 1994	FY 1995
Alabama	12,698	12,535	12,516
Alaska	1,716	1,385	1,386
Arizona	3,443	2,743	2,724
Arkansas	9,489	8,925	8,906
California	11,769	10,805	10,786
Colorado	4,149	3,660	3,641
Connecticut	3,302	2,598	2,579
Delaware	2,584	2,333	2,314
Florida	9,137	8,478	8,459
Georgia	13,093	12,474	12,455
Hawaii	2,474	1,674	1,655
Idaho	3,754	3,143	3,124
Illinois	12,486	11,659	11,640
Indiana	10,134	9,678	9,659
Iowa	12,481	10,233	10,214
Kansas	7,597	6,384	6,365
Kentucky	13,488	13,124	13,105
Louisiana	9,354	8,992	8,973
Maine	3,131	2,705	2,686
Maryland	6,020	5,553	5,534
Massachusetts	4,010	3,658	3,639
Michigan	11,125	10,490	10,471
Minnesota	11,771	9,759	9,740
Mississippi	14,121	10,770	10,751
Missouri	13,921	12,407	12,388
Montana	3,430	2,947	2,928
Nebraska	7,417	5,664	5,645
Nevada	1,749	1,471	1,452
New Hampshire	2,141	1,933	1,914
New Jersey	4,457	3,928	3,909
New Mexico	3,264	2,753	2,734
New York	13,400	11,754	11,735
North Carolina	17,960	17,182	17,163
North Dakota	5,670	3,987	3,968
Ohio	12,756	12,154	12,135
Oklahoma	9,077	8,185	8,166
Oregon	5,048	4,525	4,506
Pennsylvania	12,864	12,568	12,549
Rhode Island	1,718	1,442	1,423
South Carolina	9,378	8,968	8,949
South Dakota	4,391	3,885	3,866
Tennessee	13,422	12,958	12,939
Texas	20,919	20,347	20,328
Utah	2,386	2,172	2,153
Vermont	2,511	2,047	2,028
Virginia	11,269	10,939	10,920
Washington	5,928	5,465	5,446
West Virginia	5,245	5,033	5,014
Wisconsin	10,607	9,440	9,421
Wyoming	2,079	1,819	1,800
American Samoa	554	933	933
Guam	1,097	990	990
Micronesia	594	994	994
Northern Mariana Islands	679	920	920
Puerto Rico	8,064	8,001	7,982
Virgin Islands	934	964	964
District of Columbia	883	984	984
Sub-Total	408,898	373,017	372,048
To be allocated:			
Earmarked Efforts	5,468	43,377	42,443
FERS	0	4,000	4,000
Federal Administration	13,212	14,188	13,950
Unobligated Balance	850	0	0
Total	428,428	434,582	432,441

TABLE II
APPROPRIATION FOR PAYMENT TO STATES
BASIS OF ALLOTMENT AND MATCHING REQUIRED
FISCAL YEAR 1995

ITEM	TOTAL ESTIMATE 1995	ALLOTMENT	AMOUNT PAID W/O MATCHING	AMOUNT REQUIRED MATCHING
Smith-Lever Act:	272,582,000			
Section 3(b)		56,475,091 - fixed by Sec 3b PL 87-749	14,513,808	41,961,283
Section 3(c)		1,544,909 (178,832,000) 68,524,288 - farm population 68,524,288 - rural population 34,762,144 - equally 7,021,280 - federal administration & coordination Section 3c.1	8,021,280	1,544,909 170,810,720
Fed Employees Retirement System		4,000,000 - Fed'l contribution	4,000,000	--
Retirement & Employee's Injury Compensation		15,252,000 - Fed'l contribution	15,252,000	--
Penalty Mail		15,453,000 - Reim. to USPS	15,453,000	--
D.C.		(1,025,000) 41,000 - Fed'l Admin. 984,000 - Univ of DC	41,000	984,000
Section 3(d)	114,378,000	61,174,440 - EFNEP 256,580 - Fed'l Admin. 10,459,000 - IPM 11,234,000 - Water Quality 3,363,000 - PIA 10,000,000 - YAR 2,975,000 - Food Safety 4,285,000 - Nutr. Education 988,000 - Farm Safety 950,000 - Rural Dev. Centers 4,963,000 - Sustainable Agr. 2,000,000 - Pesticide Applicator Training 1,750,000 - Indian Reservation	61,431,000 10,459,000 5,441,000 3,363,000 1,400,000 -- 2,217,800 988,000 950,000 4,963,000 2,000,000 1,750,000	-- -- 5,793,000 -- 8,600,000 2,975,000 2,047,200 -- -- -- -- --
Title XIV, Food/Ag Act 1977, as amended, 1890 Colleges	25,472,000	(25,472,000) 1,018,680 - Fed'l Admin. 24,453,120 - To 1890 Colleges & Tuskegee	25,472,000	--
Renewable Resources	3,341,000	3,341,000	3,341,000	--
1890 Facilities	7,901,000	7,584,960 - To 1890 Colleges & Tuskegee 316,040 - Fed'l Admin.	7,901,000	--
Rural Health	2,250,000	2,250,000	2,250,000	--
Ag Telecommunication	1,221,000	1,221,000		1,221,000
SUBTOTAL	427,145,000	427,145,000	191,207,868	235,937,112
Fed'l Admin	5,296,000			
Total FY - 1995	432,441,000			

**APPROPRIATIONS FOR PAYMENTS TO STATES
STATE ALLOTMENTS, FY 1993 - 1995**

Smith-Lever Act: Section 3(b) & 3(c)	FY 1993	FY 1994	FY 1995
Alabama	5,636,834	5,805,256	5,805,256
Alaska	845,660	886,640	886,640
American Samoa	717,072	749,294	749,294
Arizona	1,476,703	1,537,818	1,537,818
Arkansas	4,762,714	4,907,418	4,907,418
California	5,895,722	6,175,349	6,175,349
Colorado	2,312,488	2,413,375	2,413,375
Connecticut	1,738,548	1,810,424	1,810,424
Delaware	998,270	1,043,941	1,043,941
Florida	3,450,980	3,628,944	3,628,944
Georgia	6,355,612	6,584,170	6,584,170
Guam	756,380	792,117	792,117
Hawaii	1,048,762	1,091,144	1,091,144
Idaho	2,097,753	2,190,315	2,190,315
Illinois	7,720,646	8,026,515	8,026,515
Indiana	6,969,925	7,269,252	7,269,252
Iowa	7,409,129	7,722,157	7,722,157
Kansas	4,309,696	4,475,526	4,475,526
Kentucky	7,298,298	7,576,252	7,576,252
Louisiana	4,224,710	4,362,714	4,362,714
Maine	1,744,080	1,820,683	1,820,683
Maryland	2,632,927	2,739,838	2,739,838
Massachusetts	2,171,721	2,261,255	2,261,255
Michigan	7,023,309	7,306,445	7,306,445
Micronesia	780,202	818,886	818,886
Minnesota	6,916,025	7,198,800	7,198,800
Mississippi	5,817,172	5,970,004	5,970,004
Missouri	6,839,245	7,112,959	7,112,959
Montana	1,959,508	2,050,152	2,050,152
Nebraska	3,913,028	4,074,770	4,074,770
Nevada	855,334	897,443	897,443
New Hampshire	1,256,100	1,320,603	1,320,603
New Jersey	2,136,250	2,225,867	2,225,867
New Mexico	1,580,263	1,645,827	1,645,827
New York	6,591,726	6,846,207	6,846,207
North Carolina	9,551,043	9,860,694	9,860,694
North Dakota	2,700,219	2,799,211	2,799,211
Northern Mariana Islands	696,166	728,978	728,978
Ohio	8,484,494	8,839,690	8,839,690
Oklahoma	4,329,311	4,486,739	4,486,739
Oregon	2,765,481	2,900,988	2,900,988
Pennsylvania	8,260,107	8,591,742	8,591,742
Puerto Rico	5,863,606	5,964,056	5,964,056
Rhode Island	845,300	884,161	884,161
South Carolina	4,637,762	4,795,717	4,795,717
South Dakota	2,797,866	2,913,384	2,913,384
Tennessee	6,972,188	7,202,755	7,202,755
Texas	9,738,128	10,116,991	10,116,991
Utah	1,291,529	1,344,112	1,344,112
Vermont	1,385,231	1,446,435	1,446,435
Virgin Islands	737,207	771,077	771,077
Virginia	5,788,162	5,990,874	5,990,874
Washington	3,264,718	3,409,527	3,409,527
West Virginia	3,362,734	3,475,538	3,475,538
Wisconsin	6,910,173	7,201,609	7,201,609
Wyoming	1,170,394	1,223,173	1,223,173
Sub - Total	219,794,611	228,285,811	228,285,811
3(b) Special Needs	1,544,909	1,544,909	1,544,909
3(c) Fed'l Admin	6,667,480	7,021,280	7,021,280
Total	228,007,000	236,852,000	236,852,000
Retirement	15,252,000	15,252,000	15,252,000
Penalty Mail	15,453,000	15,453,000	15,453,000
FERS	4,000,000	4,000,000	4,000,000
Dist. of Columbia	--	984,000	984,000
Fed'l Admin.	--	41,000	41,000
TOTALS	262,712,000	272,582,000	272,582,000

**APPROPRIATION FOR PAYMENTS TO STATES
PESTICIDE IMPACT ASSESSMENT, FY 1993 - 1995**

Smith-Lever Act: Section 3(d)	FY 1993	FY 1994	FY 1995
Alabama	25,677	28,627	28,627
Alaska	10,204	10,204	10,204
American Samoa	10,000	10,000	10,000
Arizona	26,207	28,604	28,604
Arkansas	32,679	41,344	41,344
California	107,020	87,110	87,110
Colorado	28,218	25,084	25,084
Connecticut	11,725	11,725	11,725
Delaware	21,563	21,009	21,009
Florida	48,853	62,680	62,680
Georgia	47,566	67,107	67,107
Guam	10,383	10,383	10,383
Hawaii	12,357	12,357	12,357
Idaho	36,075	26,305	26,305
Illinois	55,550	75,460	75,460
Indiana	37,760	37,576	37,576
Iowa	70,239	57,518	57,518
Kansas	47,012	43,693	43,693
Kentucky	41,687	38,369	38,369
Louisiana	31,060	27,558	27,558
Maine	12,555	12,555	12,555
Maryland	16,312	19,262	19,262
Massachusetts	15,365	15,181	15,181
Michigan	34,362	31,044	31,044
Micronesia	10,000	10,000	10,000
Minnesota	53,527	55,923	55,923
Mississippi	27,523	24,389	24,389
Missouri	44,576	44,492	44,492
Montana	21,248	18,114	18,114
Nebraska	66,919	50,696	50,696
Nevada	11,069	11,069	11,069
New Hampshire	20,391	10,989	10,989
New Jersey	22,524	30,819	30,819
New Mexico	15,967	15,967	15,967
New York	27,673	30,438	30,438
North Carolina	40,669	37,351	37,351
North Dakota	25,773	28,538	28,538
Northern Mariana Islands	10,001	10,002	10,002
Ohio	41,833	41,464	41,464
Oklahoma	41,560	43,956	43,956
Oregon	28,777	31,357	31,357
Pennsylvania	29,374	41,173	41,173
Puerto Rico	18,056	14,922	14,922
Rhode Island	10,352	10,352	10,352
South Carolina	21,020	20,835	20,835
South Dakota	36,866	30,229	30,229
Tennessee	36,307	36,123	36,123
Texas	88,966	90,625	90,625
Utah	14,352	14,352	14,352
Vermont	12,425	12,425	12,425
Virgin Islands	10,007	10,007	10,007
Virginia	24,290	27,240	27,240
Washington	28,947	40,561	40,561
West Virginia	14,521	14,521	14,521
Wisconsin	67,221	56,713	56,713
Wyoming	16,737	13,603	13,603
Sub - Total	1,730,000	1,730,000	1,730,000
Special Projects	1,675,000	1,633,000	1,633,000
Total	3,405,000	3,363,000	3,363,000

**APPROPRIATION FOR PAYMENTS TO STATES
INTEGRATED PEST MANAGEMENT, FY 1993 - 1995**

Smith-Lever Act: Section 3(d)	FY 1993	FY 1994	FY 1995
Alabama	243,941	243,941	243,941
Alaska	42,900	42,900	42,900
American Samoa	11,000	11,000	11,000
Arizona	87,000	87,000	87,000
Arkansas	263,243	263,243	263,243
California	253,100	253,100	253,100
Colorado	87,000	87,000	87,000
Connecticut	55,000	55,000	55,000
Delaware	55,000	55,000	55,000
Florida	155,200	155,200	155,200
Georgia	332,610	332,610	332,610
Guam	11,000	11,000	11,000
Hawaii	55,000	55,000	55,000
Idaho	87,000	87,000	87,000
Illinois	253,100	253,100	253,100
Indiana	190,400	190,400	190,400
Iowa	253,100	253,100	253,100
Kansas	155,200	155,200	155,200
Kentucky	87,000	87,000	87,000
Louisiana	271,600	271,600	271,600
Maine	87,000	87,000	87,000
Maryland	87,000	87,000	87,000
Massachusetts	87,000	87,000	87,000
Michigan	155,200	155,200	155,200
Micronesia	11,000	11,000	11,000
Minnesota	221,200	221,200	221,200
Mississippi	325,902	325,902	325,902
Missouri	229,489	229,489	229,489
Montana	87,000	87,000	87,000
Nebraska	221,200	221,200	221,200
Nevada	42,900	42,900	42,900
New Hampshire	55,000	55,000	55,000
New Jersey	87,000	87,000	87,000
New Mexico	55,000	55,000	55,000
New York	121,100	121,100	121,100
North Carolina	237,541	237,541	237,541
North Dakota	87,000	87,000	87,000
Northern Mariana Islands	11,000	11,000	11,000
Ohio	221,200	221,200	221,200
Oklahoma	230,900	230,900	230,900
Oregon	121,100	121,100	121,100
Pennsylvania	121,100	121,100	121,100
Puerto Rico	36,300	36,300	36,300
Rhode Island	42,900	42,900	42,900
South Carolina	209,965	209,965	209,965
South Dakota	87,000	87,000	87,000
Tennessee	191,079	191,079	191,079
Texas	632,730	632,730	632,730
Utah	55,000	55,000	55,000
Vermont	42,900	42,900	42,900
Virgin Islands	11,000	11,000	11,000
Virginia	121,100	121,100	121,100
Washington	121,100	121,100	121,100
West Virginia	42,900	42,900	42,900
Wisconsin	155,200	155,200	155,200
Wyoming	55,000	55,000	55,000
Sub - Total	7,656,400	7,656,400	7,656,400
Special Projects	543,600	802,600	2,802,600
Total	8,200,000	8,459,000	10,459,000

**APPROPRIATION FOR PAYMENTS TO STATES
FARM SAFETY, FY 1993 - 1995**

Smith-Lever Act: Section 3(d)	FY 1993	FY 1994	FY 1995
Alabama	19,019	19,019	0
Alaska	19,020	19,020	0
American Samoa	0	0	0
Arizona	19,020	19,020	0
Arkansas	19,020	19,020	0
California	19,019	19,019	0
Colorado	19,020	19,020	0
Connecticut	19,020	19,020	0
Delaware	19,020	19,020	0
Florida	19,020	19,020	0
Georgia	19,019	19,019	0
Guam	0	0	0
Hawaii	19,019	19,019	0
Idaho	19,020	19,020	0
Illinois	19,020	19,020	0
Indiana	19,020	19,020	0
Iowa	19,019	19,019	0
Kansas	19,019	19,019	0
Kentucky	19,019	19,019	0
Louisiana	19,019	19,019	0
Maine	19,020	19,020	0
Maryland	19,020	19,020	0
Massachusetts	19,019	19,019	0
Michigan	19,019	19,019	0
Micronesia	0	0	0
Minnesota	19,019	19,019	0
Mississippi	19,019	19,019	0
Missouri	19,019	19,019	0
Montana	19,020	19,020	0
Nebraska	19,020	19,020	0
Nevada	19,020	19,020	0
New Hampshire	19,020	19,020	0
New Jersey	19,020	19,020	0
New Mexico	19,020	19,020	0
New York	19,019	19,019	0
North Carolina	19,019	19,019	0
North Dakota	19,020	19,020	0
Northern Mariana Islands	0	0	0
Ohio	19,019	19,019	0
Oklahoma	19,020	19,020	0
Oregon	19,020	19,020	0
Pennsylvania	19,020	19,020	0
Puerto Rico	19,020	19,020	0
Rhode Island	19,020	19,020	0
South Carolina	19,020	19,020	0
South Dakota	19,020	19,020	0
Tennessee	19,019	19,019	0
Texas	19,019	19,019	0
Utah	19,020	19,020	0
Vermont	19,020	19,020	0
Virgin Islands	0	0	0
Virginia	19,019	19,019	0
Washington	19,020	19,020	0
West Virginia	19,020	19,020	0
Wisconsin	19,019	19,019	0
Wyoming	19,020	19,020	0
Sub - Total	970,000	970,000	0
Special Projects	1,500,000	2,018,000	988,000
Total	2,470,000	2,988,000	988,000

**APPROPRIATION FOR PAYMENTS TO STATES
FOOD AND NUTRITION EDUCATION, FY 1993 - 1995**

Smith-Lever Act: Section 3(d)	<u>FY 1993</u>	<u>FY 1994</u>	<u>FY 1995</u>
Alabama	1,959,269	1,977,500	1,977,500
Alaska	172,555	176,269	176,269
American Samoa	63,041	64,987	64,987
Arizona	559,425	574,169	574,169
Arkansas	1,248,919	1,260,851	1,260,851
California	3,306,089	3,395,214	3,395,214
Colorado	554,712	565,273	565,273
Connecticut	452,897	459,486	459,486
Delaware	220,669	223,582	223,582
Florida	2,028,220	2,068,590	2,068,590
Georgia	2,133,095	2,156,102	2,156,102
Guam	63,260	65,138	65,138
Hawaii	256,769	260,478	260,478
Idaho	291,144	296,020	296,020
Illinois	2,121,138	2,153,018	2,153,018
Indiana	1,193,997	1,209,572	1,209,572
Iowa	895,041	904,166	904,166
Kansas	689,151	697,451	697,451
Kentucky	1,646,822	1,664,057	1,664,057
Louisiana	1,858,178	1,881,187	1,881,187
Maine	418,454	423,229	423,229
Maryland	838,473	848,948	848,948
Massachusetts	967,105	980,998	980,998
Michigan	1,769,438	1,798,079	1,798,079
Micronesia	69,682	72,588	72,588
Minnesota	985,888	997,906	997,906
Mississippi	1,694,371	1,710,137	1,710,137
Missouri	1,540,243	1,557,620	1,557,620
Montana	295,429	299,992	299,992
Nebraska	534,622	540,490	540,490
Nevada	170,861	175,381	175,381
New Hampshire	237,247	240,540	240,540
New Jersey	1,068,054	1,082,997	1,082,997
New Mexico	506,066	514,663	514,663
New York	3,394,059	3,447,124	3,447,124
North Carolina	2,495,823	2,517,550	2,517,550
North Dakota	341,536	345,251	345,251
Northern Mariana Islands	61,297	63,180	63,180
Ohio	2,178,542	2,210,726	2,210,726
Oklahoma	1,043,512	1,057,218	1,057,218
Oregon	491,618	501,514	501,514
Pennsylvania	2,674,542	2,706,429	2,706,429
Puerto Rico	1,434,538	1,470,457	1,470,457
Rhode Island	301,382	305,135	305,135
South Carolina	1,508,390	1,522,310	1,522,310
South Dakota	385,718	389,846	389,846
Tennessee	1,958,079	1,977,278	1,977,278
Texas	4,167,402	4,238,109	4,238,109
Utah	307,368	313,783	313,783
Vermont	233,258	236,165	236,165
Virgin Islands	62,065	63,885	63,885
Virginia	1,672,785	1,689,026	1,689,026
Washington	676,743	690,711	690,711
West Virginia	966,995	976,565	976,565
Wisconsin	951,069	965,005	965,005
Wyoming	187,635	190,495	190,495
Sub - Total	60,304,680	61,174,440	61,174,440
Fed'l Admin	220,320	256,560	256,560
Total	60,525,000	61,431,000	61,431,000

**APPROPRIATION FOR PAYMENTS TO THE 1890 LAND-GRANT COLLEGES
AND TUSKEGEE UNIVERSITY, 1993 - 1995**

INSTITUTIONS	<u>FY 1993</u>	<u>FY1994</u>	<u>FY1995</u>
Alabama			
Alabama A&M University	1,274,488	1,310,487	1,310,487
Tuskegee University	1,274,488	1,310,487	1,310,487
Arkansas			
University of Arkansas, Pine Bluff	1,152,100	1,183,922	1,183,922
Delaware			
Delaware State University	416,484	427,929	427,929
Florida			
Florida A&M University	1,061,531	1,098,811	1,098,811
Georgia			
The Fort Valley State College	1,528,392	1,576,218	1,576,218
Kentucky			
Kentucky State University	1,913,376	1,973,939	1,973,939
Louisiana			
Southern University and A&M College	1,057,358	1,087,032	1,087,032
Maryland			
The University of Maryland, Eastern Shore	811,485	835,170	835,170
Mississippi			
Alcorn State University	1,261,610	1,294,632	1,294,632
Missouri			
Lincoln University	1,912,073	1,972,090	1,972,090
North Carolina			
North Carolina A&T State University	2,288,585	2,352,703	2,352,703
Oklahoma			
Langston University	1,144,629	1,179,540	1,179,540
South Carolina			
South Carolina State University	1,111,690	1,145,349	1,145,349
Tennessee			
Tennessee State University	1,728,786	1,778,219	1,778,219
Texas			
Prairie View A&M University	2,346,393	2,426,150	2,426,150
Virginia			
Virginia State University	1,457,332	1,500,442	1,500,442
<hr/>			
Sub-Total	23,740,800	24,453,120	24,453,120
Federal Administration	989,200	1,018,880	1,018,880
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Total	24,730,000	25,472,000	25,472,000

**APPROPRIATION FOR PAYMENTS TO STATES
1890 FACILITIES, 1993 - 1995**

FACT ACT, Section 1447:	FY 1993	FY1994	FY1995
Alabama			
Alabama A&M University	427,902	422,607	422,607
Tuskegee University	427,902	422,607	422,607
Arkansas			
University of Arkansas,Pine Bluff	411,011	405,926	405,926
Delaware			
Delaware State University	328,626	324,560	324,560
Florida			
Florida A&M University	433,080	427,721	427,721
Georgia			
The Fort Valley State College	475,719	469,833	469,833
Kentucky			
Kentucky State University	527,216	520,692	520,692
Louisiana			
Southern University and A&M College	402,328	397,350	397,350
Maryland			
The University of Maryland, Eastern Shore	378,113	373,433	373,433
Mississippi			
Alcorn State University	415,862	410,717	410,717
Missouri			
Lincoln University	525,008	518,512	518,512
North Carolina			
North Carolina A&T State University	541,590	534,886	534,886
Oklahoma			
Langston University	423,505	418,263	418,263
South Carolina			
South Carolina State University	418,443	413,265	413,265
Tennessee			
Tennessee State University	482,216	476,248	476,248
Texas			
Prane View A&M University	604,822	597,336	597,336
Virginia			
Virginia State University	456,657	451,004	451,004
Sub-Total	7,680,000	7,584,960	7,584,960
Federal Administration	320,000	316,040	316,040
Total	8,000,000	7,901,000	7,901,000

STATUS OF PROGRAM EXTENSION SERVICE

The Cooperative Extension System, a national educational network, is a dynamic organization pledged to meeting the country's needs for knowledge and educational programs that will enable people to make practical decisions. Its mission is to help people improve their lives through an educational process that uses scientific knowledge focused on issues and needs.

Extension programs effectively reach diverse segments of society including agricultural producers, renewable resource managers, businesses, families, youth, and communities. Extension informs program participants of recommended practices and educates program participants to obtain, understand, and apply relevant information in deciding how to lead their lives and pursue their livelihoods.

Last year over 40 million Americans living in nearly all the Nation's 3,150 counties received practical education through direct contacts with Extension professionals or paraprofessionals. Each year Extension agents work with nearly 3 million volunteers who, in turn, contact about 48 million other adults and youth, a national study finds. Individual Extension educators average nearly 5,300 direct contacts annually, plus many times that communications, and other means.

Through these contacts, Extension program participants benefit by acquiring new understandings and skills and by adopting improved practices and technologies toward achieving their respective goals, e.g., increased income, family stability, and personal adjustment. These new understandings, skills, and adoptions also result in public benefits. Such public benefits include saving millions of dollars nationally by preventing or reducing the incidence of school dropout, drug addiction, farm accidents, low birth weight, and contamination of food and water supplies. As a county commissioner in Indiana said recently, "If our Extension program prevents just five low birth weight babies in a year, it will save more than the \$185,000 that the county spent this year on the entire Extension program."

Programs Addressing Recent National Concerns

Floods: The Cooperative Extension System has implemented a major educational effort to assist people and communities adversely impacted by excessive rainfall and flooding during the Summer of 1993. These educational programs are conducted by State Cooperative Extension Services, and aided by a \$3.5 million Congressional appropriation for victims of flooding and other disasters in 1993. From this amount, \$2.9 million was awarded to the nine Midwestern States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Extension staff are responding to the broad needs of the community by providing information and access to resources from USDA and State Land Grant Institutions. These efforts bear directly on the problems created by flooding and adverse weather. Extension personnel are operating from "centers" staffed and located to meet specific needs. They are cooperating with other agencies including ASCS, SCS and FEMA. Efforts to pool resources and information across State lines are also taking place. Assistance is focused on immediate needs with recognition that planning for restoration of fields and structures, and for financial recovery will occur over a longer period of time. Initially, Extension efforts targeted immediate problems by providing hot lines, fact sheets and other information services that reduced stress, aided reentry to homes, promoted access to safe water and food, aided clean-up activities and assisted with applications for disaster relief. During this entire disaster, Extension's computer and telecommunications capabilities have provided information and education to residents and staff in a fast, efficient, and economical manner.

Current activities are focusing on meeting short-term financial needs, alternate sources of support, and restoration of farm operations and community viability. Considerable effort is devoted to restoration of livestock facilities and testing of feedstuffs. Through flood-response centers, Extension staff and volunteers are assisting families with further clean-up, protection of property, assessment of financial status and acquisition of additional support, and management of emotional stress. Youth are enrolled in projects that are aiding clean-up, restoring community structures, providing child care and mutual support.

Drought: Many States in the southeast have been adversely effected by the drought in 1993. Many farmers and their families are under financial and physical stress. To assist the farm community, the Cooperative Extension System has initiated programs that offer in-service training for Extension personnel, and collaborative programming with other government agencies to address the needs and concerns of area farmers, farm youth, and families. Further, funds are being allocated to States such as Georgia, North Carolina and Virginia to assist farmers and farm families with educational programs and personal assistance on farm and financial management, family resource and stress management, management alternatives to crop and livestock producers for recovery and relief in their farming operations, and development of strategies and educational programs for producers to help them minimize the effect of future adverse weather conditions which may occur at various times during the year on their farming operations. Additionally, another program is being developed for bankers and other agribusiness firms to help farm clientele who need assistance.

E. Coli: In response to the E. coli outbreak, the Extension rapid response system was an important mechanism for notifying States of the time-sensitive information. This electronic-based communication system allows States to be prepared with educational messages for public inquiries and to take advantage of opportunities for education. The System was used to disseminate news of the outbreak, FSIS-USDA news releases, backgrounders and consumer recommendations, Departmental testimony, and Senate testimony of various CES specialists throughout January and February, 1993. Many states can now route the electronic messages immediately to county offices. Washington Extension faculty with related expertise worked together to get out a backgrounder on E. coli that was also disseminated nationwide immediately after the outbreaks.

Many ongoing Extension food safety programs address safe food handling recommendations and processes that address the concerns of E. coli as well as all microbiological/pathogen issues. Under the leadership of Colorado, the Safety & Food Excellence (SAFE) program is training volunteers and Extension agents in 8 western States to deliver a safe food handling curriculum to groups or agencies that serve foods to elderly persons and others with weakened immune systems. Many States are involved in HACCP education programs for meat, poultry and other food industry that include control of microbiological hazards.

Other programs that began in September, 1993 include that of Texas, who will be providing education for meat market food handlers in three metropolitan areas in the state. Washington Cooperative Service is establishing the statewide FOODLINK, a vehicle for inter-agency coordination for food handler education, consumer education, and food safety emergency responses. The comprehensive information communication system (FOODLINK) will initially link Washington State University Cooperative Extension; Washington state agencies including the Department of Health, Department for Agriculture, and Department for Community Development (Office of Emergency Management); USDA Food Safety and Inspection Service Area Office (Salem, OR); and representatives of the food industry including the Washington Food Dealers Association and the Restaurant Association of Washington. It will provide internet linkages between these stakeholders as well as establish SAFEFOOD, a public mail group reflector, to allow participants to ask questions and receive answers about food safety. It will also broaden access to food safety education specialists world wide. A second private mail group reflector, WASHLINK, will be established for communication between educators and agencies in Washington state. FOODLINK will also provide, through the WSU domain, access to NorthWest Net. This will enable inter-agency participants to retrieve documents and access national bibliographic reference databases such as Medline and ERIC.

Programs Impacting Food, Agricultural, and Natural Resource Needs

At least five national Extension programs educate agricultural producers and related audiences to safeguard the food supply and minimize environmental harm while fostering agricultural productivity. First, the National Extension Sustainable Agriculture Initiative embraces several approaches--low input, organic, diversified, regenerative--to balancing short-and long-term economic, environmental, and food safety factors in production agriculture. The magnitude of Extension sustainable agriculture programs is exemplified by Tennessee Agricultural Extension Service activities in 1992: over 400 educational events promoting consideration of sustainable agriculture reached approximately 15,000 people,

including farmers, agribusiness operators, and consumers. An example of Extension sustainable agriculture programming is the delivery of improved weather information to farmers.

This can reduce the untimely use of water, pesticides, and fertilizers and thus increase agricultural production and profits as well as safeguard both the food supply and the environment. Extension and the State Agricultural Experiment Stations conduct Sustainable Agriculture Research and Education (SARE) programs in more than 35 states.

Second, every state Extension Service commits resources to Integrated Pest Management (IPM) programs. In 1990, Extension IPM programs trained 11,000 IPM scouts and over 45,000 agricultural producers. As a result, Extension directly influenced pest management strategies used by 150,000 agricultural producers on 11 million acres of cropland. In 1991, New York Cooperative Extension reported results of one of its IPM programs with 147 growers raising fruit crops on 2,260 acres. Program participants reduced levels of application of pesticides by 40 percent on strawberries, 30 percent on apples, and 15 percent on grapes for a total reduction in application 28,000 lbs. of pesticide product. A study conducted in 16 states found that the users of IPM report higher net returns than non-users due primarily to obtaining higher crop yields. This evaluation also found that nearly two-thirds of private IPM consultants reported that Extension was for them a primary source of research-based information on integrated pest management.

Third, all state Extension Services conduct water quality programs as part of the National Extension Water Quality Initiative. Extension water quality programs influence agricultural producers, households, and public policy leaders as well as the public in general to adopt practices that can reduce the risk of contaminating surface and ground water. For example, corn producers participating in Extension Water Quality programs have reduced their annual use of commercial nitrogen fertilizer without affecting crop yields. By 1990, application rates of nitrogen fertilizer by participating producers averaged about 30 pounds per acre less than in the mid-1980s. For a Midwestern corn producing farm of 300-350 acres, this reduction in fertilizer use translates into savings of approximately \$1,000 per year. The total savings in Iowa from reduced nitrogen fertilizer applied to its more than 12 million acres of corn is approximately \$60 million annually.

Extrapolating these Iowa savings to the national corn acreage of over 60 million acres suggests that Extension programs helps American farmers save approximately \$300 million dollars annually through reduced fertilizer costs to corn alone.

An independent analysis of changes in U.S. agricultural productivity, by the Economic Growth Center at Yale University, over the period 1950-1982 documents Extension's contributions in terms of cost/benefit ratios. An additional investment of one dollar in crop-oriented Extension programs was found to result in an increase of \$5.90 to \$8.62 in the value of crops sold. An additional investment of one dollar in livestock-oriented Extension programs was found to result in an increase of \$4.60 to \$5.80 in the value of livestock sold.

During the financial crisis experienced by major portions of the farm sector in the mid-1980's, Extension conducted intensive Farm Financial Planning and Management (FFPM) programs nationally. A national sample of the total of 480,000 agricultural producers who participated in these mid-1980's programs was surveyed to ascertain the results of their participation. Responses to this survey were received from 4,268 producers. These respondents estimated that their individual farm profits increased by \$20,000, on average, due to their program participation within the period 1984-1988. The 4,269 respondents in the study perceived improvement in profit totaling approximately 84 million dollars. While statistical limitations prevent generalizing these results to the nearly one-half million participants in this Extension program, the findings suggest that the increase in producers' net income over the period 1984-1988 totaled into the billions of dollars. This increased income is partly explained by the fact that when approximately half the nation's farms had negative net income and ten percent of farmers were leaving farming, nearly 83 percent of the participants in Extension farm financial planning programs had no difficulty obtaining credit.

The national Farm Safety program began in 1975, and since that time Extension has trained over 17,000 professionals in farm accident extrication procedures, and trained nonprofessionals in first-on-

the-scene emergency response procedures. These programs reduce the severity of the injury to the accident victim and the risk of injury to the rescuer, and also emphasize the value of accident prevention.

In response to the Renewable Resources Extension Act, Extension instructs private landowners and public land managers on conservation techniques, tree improvement, and financial analysis. Extension provides approximately 600 staff years of natural resource programming annually. This effort, over FY 1989-91, resulted in the following accomplishments nationally:

- o 1,200,000 private non-industrial forest landowners contacts;
- o 50 million acres of improved forest land management;
- o \$670 million increased revenue from forestry and wildlife management practices;
- o 23,000 forest industry worker assists;
- o \$28 million in savings through improved forest industry efficiency;
- o continuing education training for 68,000 natural resource professionals; and
- o 62,000,000 acres of rangeland positively impacted.

Extension Wood Products programs are exemplified by New Hampshire Extension's assistance to provide firms in grade and lumber recovery. One assisted firm reduced losses from lumber stain by \$250,000. A biomass energy firm saved \$375,000 per year through better fuel management. Another firm saved \$400,000 through better drying and process control.

Extension Wildlife Management programs influence the management of over 100 million acres of privately owned wildlife habitats. This influence is effected by educating natural resource professionals, managers, and private landowners on the topics of habitat management, wetlands, and damage prevention and control, and endangered species protection and management.

Programs Impacting Family, Community and Businesses Needs

Teaching basic principles in its national Food Safety program, and in coordination with the Food Safety Inspection Service, Extension annually answers approximately 6 million telephone inquiries, reaches 45 to 50 million consumers through the media, distributes several million fact sheets, and reaches 10 million individuals through workshops and other direct contacts. Within 24 hours of the 1993 outbreak of E.coli in the State of Washington, Extension's electronic mail Rapid Response system alerted state Extension Services to the occurrence of the emergency. Educational materials were mailed later that same week.

In the past three years, the national Expanded Food and Nutrition Education Program (EFNEP) has emphasized reaching low income pregnant and parenting teens and adults through state programs such as "Have a Healthy Baby" (Indiana), "Great Beginnings" (New Hampshire), and "Teen-age Mothers" (Georgia). Preliminary evaluations show improvements in birth weights of babies through improved health practices of participating mothers. For FY 1991, EFNEP funding increased by about 3 percent. In turn, the number of families participating in EFNEP increased by 12 percent (232,178 versus 206,657 in FY 90) and the number of participating youth increased by 11 percent (482,586 versus 434,823 in FY 90).

Extension Family Financial Management programs are illustrated by an Illinois program that taught more than 15,000 homemakers how to complete tax returns. Approximately two-thirds of the program participants had annual incomes of less than \$6,000. Program participants received more than \$10.5 million in tax refunds and earned income credits in 1991. The average tax refund per participating family was \$600. This is just one example of how a Family Financial Management program can allow citizens to become more responsible for their own welfare.

To reduce academic, physical, social, and emotional problems among children, Extension provided Parent Education programs to over 530,000 adults in 22 states during 1990.

In all regions of the Nation, Extension's Waste Management programs provide information and technical assistance to local officials and individuals on dealing with the problems of increased waste

volume and closing landfills. In Massachusetts, where 26 rural towns were faced with skyrocketing disposal costs and restricted budgets, Extension led in forming a 50-member planning board that spearheaded the development of the largest solid waste district in the state. Extension education is reducing the solid waste stream. In Montgomery County, Ohio, for example, the 40,000 tons of grass clippings collected in 1989 were reduced to 15,000 tons in 1990, saving the county \$650,000 in trash disposal costs. In Florida, as a result of an innovative Extension program, blue crab waste is mixed with wood processing wastes to form a rich compost product, reducing the amount of crab waste entering landfills by 13 tons daily.

Extension Industry Development programs are exemplified by Cornell University, in New York, that has a research and Cooperative Extension program to help industries adopt new technologies and conduct in-house training of business employees. Some 4,000 businesses have been counseled, 2,000 jobs were created due to expanding businesses, and energy audits of 21,000 firms served to conserve energy. Several other states have similar Extension programs.

Exemplifying Extension Rural Development program results, more than 1,200 low-income people over age 55 gained employment as a result of training provided by Maine Cooperative Extension. This program was supported by a grant from the National Council on the Aging.

Programs Impacting Youth Needs

Nearly one fifth of total Extension staff time is devoted to 4-H Development with about 5.6 million participating youth. A national survey of the alumni of youth organizations showed that, in comparison with former members of other youth organizations, former 4-H'ers were more likely to report adult-life benefits from knowledge and skills gained through their participation; and 4-H'ers are more likely to be active in community affairs and leadership positions.

In 1991, Extension involved 1.2 million youth in natural resource and environmental education programs focusing on wildlife habitat, stream protection and enhancement, threatened and endangered species, recycling, energy conservation, water and air quality, forestry, range management, and soil conservation. Around the country, 4-H Clubs have won local, state, and national awards for adopt-a-stream and adopt-a-highway project to enhance our environment.

Extension Youth at Risk (YAR) programs at 95 sites across the Nation annually involve a total of nearly 70,000 youth and 16,000 parents. An independent evaluation finds that "for a relatively small amount of money, YAR programs have enriched the lives of a number of children and their families in diverse areas of the country." The city of Boston has requested that Extension establish at least 22 4-H clubs in 11 inner-city neighborhoods. Annually, USDA has provided up to \$10 million in Federal funds to YAR programs. The state Cooperative Extension Services and local communities have provided a match equal to allocated Federal funds; and additionally, the private sector has provided approximately \$10 million to support YAR programs over the three years of this national Extension initiative.

Programming through Extension Volunteers

Extension agents average 15 percent of their worktime developing the leadership skills of program participants and volunteers. Each year Extension agents guide, and support nearly 3 million Extension volunteers who, in turn, transfer information to and educate about 48 million other adults and youth, a national study finds. Approximately 95 percent of Extension clientele say that volunteers helped them acquire new information, and 87 percent report that volunteers helped them develop new skills.

Extension volunteers work with Extension program participants about 51 days, on average, for everyday an Extension professional invests in training, guiding and supporting volunteers. Nationally, the financial value of volunteer time contributed is 5 times greater than the financial value of combined Federal, state and local funding to Extension programs.

WEDNESDAY, MARCH 2, 1994.

NATIONAL AGRICULTURAL LIBRARY

WITNESSES

PAMELA Q.J. ANDRÉ, ACTING DIRECTOR, NATIONAL AGRICULTURAL LIBRARY

MARIA G. PISA, ASSISTANT DIRECTOR FOR POLICY AND PLANNING

MARLENE TAYLOR, ADMINISTRATIVE MANAGER

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

Mr. DURBIN. The National Agricultural Library will be the next witnesses—Pamela André, Acting Director; Maria Pisa, Assistant Director for Policy and Planning; Marlene Taylor, Administrative Management, and Steve Dewhurst, Sancho Panza of the subcommittee. [Laughter.]

Ms. André, please proceed.

OPENING REMARKS

Ms. ANDRÉ. Thank you, Mr. Chairman, and I would like to open by saying that we librarians no longer say shhh.

Mr. DURBIN. Good.

Ms. ANDRÉ. It's a pleasure for me to appear before you to explain the fiscal year 1995 budget request of the National Agricultural Library.

A month ago, our director, Joe Howard, retired after providing leadership to the National Agricultural Library for the past ten years. I have been designated Acting Director until a permanent director is named. My permanent NAL position is as Associate Director for Automation.

OVERVIEW

In my remarks, I'll first give you a short overview of the National Agricultural Library, the scope of our operations and activities, and then I'll talk briefly about what we hope to accomplish with the 1995 budget request.

The National Agricultural Library is one of three national libraries of the United States. The collection at NAL totals nearly 2.2 million volumes, making us the largest agricultural library in the world.

To give you a feel for the scope of our collection, it takes about 48 miles of bookshelves to accommodate that number of volumes, but the collection is not just books. The library subscribes to about 22,000 periodicals each year.

In addition to that, we have a collection of audio-visual materials such as photographs and films. We have research reports, theses; maps; patents; computer software and electronic databases.

The collection at NAL grows by about 20,000 volumes annually. This rate of growth has caused problems for us in recent years as we are running out of space to store materials. However, we are currently taking steps to deal with this problem, and so far we have begun to electronically miniaturize selected parts of the collection.

AGRICOLA

Access to the NAL collection is provided through AGRICOLA, the library's agricultural union catalog. AGRICOLA, which stands for agricultural on-line access, is available on line or on compact disc, and contains over three million citations to agricultural literature.

It is used by agricultural researchers worldwide, and NAL, with the help of the land grant library community, adds thousands of records to this database each year.

STAFFING

NAL has a staff of about 200 people, which includes librarians, computer specialists, and information specialists. A number of the NAL staff work at 11 specialized information centers established by the library. These centers provide customized information services in areas of particular concern to the world agricultural community.

PLANT GENOME

As an example, the intense national activity in the area of plant genome mapping and research has had a tremendous impact on demand for information services from our plant genome data and information center.

Throughout the year, the staff has been adding new research results to our plant genome database. As a result, this database which is now available on the Internet, is the most up-to-date one available anywhere.

As I stated earlier, it is the role of NAL to gather, maintain and make accessible agricultural information. Those we serve include federal, state and local governments, scientists, officials, farmers, professors, researchers, students, universities and colleges, private scientific and agricultural organizations, business leaders, the news media, the general public, and more and more, foreign agricultural organizations.

The 1990 Farm Bill gave NAL the authority to serve as the primary agricultural information resource of the nation. Various provisions of the Farm Bill formally recognized NAL's responsibility to the public, private and international agricultural information communities in addition to the USDA.

The provisions also broadened the Library's responsibilities within the research and education community, directing us to cooperate with and coordinate efforts among public and private sector libraries and information centers in developing an agricultural library and information network.

NETWORKING

One of the ways we're currently meeting that responsibility is through planning for an agricultural network information center.

Working with the USDA Extension Service, Iowa State University, Cornell University, the National Science Foundation and network service providers, NAL envisions this network as a distributed electronic source of agricultural information which will be available over the Internet.

While still in its infancy, NAL and the other participants nevertheless have high expectations for AgNIC as a means of enhancing access to agricultural information.

Also related to network building, NAL is the coordinator and primary resource for a nationwide network of state land-grant university libraries and USDA libraries which form a document delivery service that allows interlibrary loan of agricultural materials nationwide.

TEXT DIGITIZING

NAL also works closely with land-grant university libraries in using newly developed and experimental electronic technology to improve access to the nation's agricultural knowledge. Such technologies as compact disc-read only memory, known as CD-ROM, laser discs, computer networks and optical scanning have been used.

A program using this technology that we're particularly proud of and that has succeeded far beyond our expectations is called the national agricultural text digitizing program. Working with land-grants since 1986, NAL has electronically scanned material in key subject areas and placed it on compact discs.

These discs were distributed throughout the land-grant system, and to other locations worldwide. This is a significant step in moving toward the electronic library, an institution which can provide access to information regardless of its location.

Subjects covered on these discs include aquaculture, acid rain, Agent Orange, selected materials from the papers of George Washington Carver, and home landscaping.

We also worked closely with the American Society of Agronomy in producing a disc containing issues of the Agronomy Journal dating from 1907 to 1924, and other discs are currently being developed.

This is just a brief sketch of the Library's activities, responsibilities and resources, but I hope it will give you some idea of the direction in which NAL is heading. Knowing that direction will help you understand our budget needs, as I now move to talk specifically about the Library's fiscal year 1995 budget request.

FY 1995 BUDGET REQUEST

For fiscal year 1995, NAL is requesting funding in the amount of \$19,620,000. This represents a net increase of \$1,465,000 over the fiscal year 1994 appropriation. As you will see, there is a strong emphasis on electronic information in our proposal.

ELECTRONIC INFORMATION INITIATIVE

An increase of \$1 million is being requested for our electronic information initiative. The world of information management is changing daily. The current paper-based information delivery sys-

tem is inadequate to keep pace with the needs of the modern agriculturist.

Increasingly, information is produced in digital form, and with recent telecommunications innovations and the Internet, the computer resources available to users are expanding exponentially.

The length of time expended for traditional publication, procurement, physical handling, indexing and document delivery processes is no longer adequate. The transition from a print-based collection to the electronic library will require a dramatic shift in the ways in which NAL has traditionally provided information services.

The funds will be used to bring Internet-based information services to users and to create access to NAL information services such as the AGRICOLA database, using the Internet.

Initially, expenditures will focus primarily on infrastructure development. In subsequent years, funding will shift to data access and licensing expenditures necessary to maintaining an electronic library.

Unquestionably, funding of the electronic information initiative will better position NAL to function effectively in today's quickly evolving environment of worldwide, instantaneous access to information.

PRESERVATION AND STORAGE

An increase of \$400,000 is for the preservation and storage of the NAL collection and other valuable agricultural information.

As I said earlier, NAL is running out of space at its Beltsville facility to store materials, and yet the collection continues to grow by thousands of items each year.

Also many of the older items in the collection are deteriorating rapidly and preservation steps must be taken soon or these items will be lost forever.

The \$400,000 increase for storage and preservation would be used to establish a national storage and preservation program for agricultural literature which would begin the task of miniaturizing and preserving the library's collection.

The use of optical scanning to store and preserve information is at the forefront of current information management and access technology.

The funds would help us implement a strategy to preserve and store information in electronic form. We envision this process as a national cooperative effort involving NAL, the United States Agricultural Information Network, land-grant institutions, and other libraries, societies and archives.

JOURNAL SUBSCRIPTIONS

An increase of \$398,000 is requested to cover the inflationary rise in the costs of acquiring and processing the NAL collection. About 80 percent of NAL acquisition funds are used to purchase subscriptions to agricultural and scientific journals.

Subscription prices to most journals have increased an average of ten percent annually since 1984. The price of journals on special topics like biotechnology, for example, has increased by nearly 17 percent in one year alone.

NAL believes that the cost of maintaining its journal collection will rise by a minimum of 10 percent in fiscal year 1995. The proposed \$398,000 increase would partially cover this rise.

DOCUMENT DELIVERY SERVICES

An increase of \$281,000 would cover the rise in the cost of NAL's document delivery services. User demand for NAL document delivery services continues to increase and labor costs for these services is also rising.

With our information, scientists can build upon past research rather than duplicating research that has already been done. NAL needs the increase to ensure that we can meet our responsibility to provide documents to those who need them when they are needed.

PAY COSTS

Finally, an increase of \$99,000 would go to meet pay costs.

Within constrained resource levels, we feel that the most effective use of funding would be the investment in storage and preservation, and the electronic information initiatives that we've discussed.

With the funding we have requested for fiscal year 1995, we at NAL believe that we will be able to continue to collect and maintain agricultural information while we work to comply with requirements that federal agencies reduce costs. NAL has always prided itself on getting the most from its budgets, and I assure you that we will continue to do so.

Thank you for your attention. I would be happy to respond to questions.

[CLERK'S NOTE.—The Acting Director's biographical sketch appears on page 809. The opening statement appears on pages 810 through 820. The Explanatory Notes appear on pages 821 through 840.]

CONTRACTUAL EMPLOYEES

Mr. DURBIN. Thanks, Ms. Andre. You probably heard our earlier questions to the Agricultural Research Service about the number of contractual employees. The Library has some 200 FTEs.

Ms. ANDRÉ. That's right.

Mr. DURBIN. Do you know how many contractual employees there are?

Ms. ANDRÉ. We have approximately 100 contractual employees. About 50 of those are under a service contract for our document delivery services, and that was contracted out over ten years ago as a result of an A-76 issue.

The additional 50 we have on-board through a variety of cooperative agreements with land-grant universities.

Mr. DURBIN. Let's talk about the service contract for a moment. One of my friends has suggested that his experience in Federal service when he was compelled to move towards this type of arrangement resulted in higher costs and less control of that service in the out-years.

Initially there appeared to be a great savings, but then as the years went by, the contract proved to be more expensive and there was less control when, in fact, they were employees working for the agency.

What has been your experience at the Library?

Ms. ANDRÉ. Our experience specifically with the document delivery contract is that the prices are very much the prices that we would have to pay if we were trying to do this activity internally.

We also were concerned about the control of contractors, but I think the people that we have at the library who developed and administer this contract are very much aware of that, and we've tried, as the years have gone by, to build those kinds of controls into the contract.

FTEs

Mr. DURBIN. How many of the 200 FTEs which you have, are you expected to reduce over the next several years as part of the overall agency reduction?

Ms. ANDRÉ. For fiscal year 1994, our ceiling is 209 employees. That ceiling continues for fiscal year 1995. In fiscal year 1996, that will have to be decreased to 204. That is part of the USDA plan.

Mr. DURBIN. That's about a 2½ percent decrease in terms of your total number of FTEs. Are there any anticipated decreases in service employees, contract employees?

Ms. ANDRÉ. That's a more difficult question. As I said in the testimony, we are getting more and more requests for our information through the document delivery system, so it is very difficult to say what we would be able to cut.

CONTRACT WORK

Mr. DURBIN. Please describe for the record the type of work you contract out, the need to contract out, and the cost of contracting out versus doing the work in-house.

Ms. ANDRÉ. NAL contracts out for work in several categories: document delivery services; repair and maintenance services for the NAL Building; and specialized information services.

The document delivery services include both the use of a commercial firm at the Library in Beltsville, Maryland, and the establishment of cooperative agreements with land-grant university libraries, which provide documents to USDA staff throughout the United States on a regional structure. Overall, the provision of document delivery services is a core reference function of NAL's mission to provide agricultural information to researchers, scientists and agriculturists. The contract staff of the commercial firm are employed to receive, track and photocopy materials to fill requests received at NAL in Beltsville. We do not have a current comparison of the cost to perform these functions in-house versus doing the work on a contract basis, although we do know that contracting for document delivery services was found to be less costly when this activity was first contracted out in fiscal year 1982. Given that this service contract is highly labor intensive, it is our belief that these costs are now roughly comparable.

Regarding the use of the cooperative agreements with the land-grants to provide documents directly to USDA users in the United

States regional locations, we believe this arrangement represents overall a cost savings to NAL. This is because this system reduces the costs of envelopes, paper supplies, and postage costs of mailing documents, as well as increases the speed of delivery.

NAL contracts out for a large portion of the work necessary to repair and maintain the NAL Building in Beltsville, Maryland. Included in this category is an array of ongoing services, such as security guards, janitorial work, pest control and mailroom operations. In addition, we contract for architectural and engineering services as well as for construction and renovation work, relating to major projects such as the recent book lift and passenger elevator upgrading. Overall, we do not find it feasible to perform this work in-house, and believe that contracting out for the services needed is the most cost-effective approach, based on the wide range of activities and functions involved.

The category of information services includes NAL's use of the staff resources of cooperating institutions—typically the land grant universities and their libraries—to provide assistance to NAL in the dissemination of highly specialized agricultural information. Through our cooperative agreements with these institutions, we work towards increasing access to agricultural information. As an example, we utilize the services of university graduate students in fields such as horticulture, nutrition, rural sociology and animal sciences—as well as graduate students with dual backgrounds in library science and agriculture—to provide reference services and to develop various specialized information products in support of NAL's information centers.

CONTRACT WORK—COSTS

Mr. DURBIN. Provide a table showing the amount of work that has been contracted out for the past five years, including estimates for fiscal year 1994.

Ms. ANDRÉ. I will be happy to provide that information for the record.

[The information follows:]

Fiscal year:	Document delivery services contracts	General services, repair and maintenance contracts—NAL building	Specialized information services contracts
1989	\$839,691	\$503,371	\$—
1990	869,211	634,260	84,132
1991	1,210,314	564,898	391,090
1992	1,159,733	1,353,188	1,108,728
1993	1,214,084	795,672	875,044
1994 Estimate	1,300,000	1,400,000	900,000

DOCUMENT DELIVERY

Mr. DURBIN. Explain the document delivery system to me. Is that where requests are made of the Library to actually deliver copies of books or publications, and in fact, the Library absorbs the costs of transporting or shipping that material?

Ms. ANDRÉ. We are a central node in a national document delivery network. We have effectively established cooperative relationships with a number of land-grant universities across the country, and we have divided the country into approximately eight regional document delivery areas.

In each of those areas, there is a land-grant university which functions as the regional node, so as requests come in, we urge people to first request materials from their local land-grant library. If that library is able to provide it, it's very fast, effective service.

If that library is not able to provide it, then that request moves to the regional center and the request is handled there, if it is possible.

If that regional node is not able to handle it, then the request comes to the National Agricultural Library, and we then handle it, and yes, at this point, it is a question primarily of making photocopies of the requested material and sending that material out to the requester.

However, more and more, as we move into this electronic environment, we are sending out these materials electronically. Not only are we sending them out, but we are receiving requests electronically as well, thus making the whole process more efficient.

Mr. DURBIN. That would seem to diminish the costs of delivery. I believe that about ten percent of your budget or more is being allocated for this purpose, and you are asking for an increase.

Ms. ANDRÉ. That's right, because at this point I mentioned electronic delivery, but we're only doing a very, very small percentage of our delivery electronically.

Again, as I said in the testimony, we're in a transition phase in this whole aspect of electronic information, so we have found based on our previous budget, that in order to meet the same level of need for this coming fiscal year, we will need additional funding.

USER PROFILE

Mr. DURBIN. Give me a profile of the users of the Library, the folks who actually take delivery of these documents.

Ms. ANDRÉ. We have users in the agricultural research community. We have users in the library community. We have users in the extension service community. That is they are there at the grassroots level providing information to the farmer. We are their back-up.

Mr. DURBIN. What percentage of your users would you classify as non-governmental, including universities.

Ms. ANDRÉ. Approximately half of our document delivery is non-governmental.

USER FEES

Mr. DURBIN. Isn't it true that the Library has the authority to charge a user fee for these delivery services?

Ms. ANDRÉ. Yes, it is, and in fact, we have established a policy of having a core service that is not to include more than an hour of a reference librarian's time. Once that is exceeded, we have a series of costs.

Mr. DURBIN. I understand probably by your training and nature, the thought of charging people for this service is a little bit repug-

nant. Most librarians would like to feel that they are providing information in the free flow of this.

Ms. ANDRÉ. Yes, freely.

Mr. DURBIN. Let me ask you this. Would it be reasonable to suggest that non-governmental requesters pay a user fee for delivery services that actually compensates your agency for the costs that are incurred?

Ms. ANDRÉ. Let me give you a sense of what the fee structure is that we charge for reference services that are beyond the threshold.

For professional time, we charge \$11.00 an hour. For support time, we charge \$5.50 per hour. We also have a computer time charge that varies depending on the amount of searching time and the cost to us, so that is an opportunity for us to get reimbursed for some of those costs.

In addition, there is a processing fee, a \$10.00 fee per request and in addition to that, we charge for photocopying of whatever materials we have to copy and send out.

Mr. DURBIN. I thought I heard you say earlier that you charged a fee after one hour had expired. These fees you describe are for extraordinary requests.

Ms. ANDRÉ. That's right, yes.

Mr. DURBIN. So for the ordinary request for a copy of something that might take less than an hour of staff time to produce, there is no charge. Is that accurate?

Ms. ANDRÉ. Yes. We do charge for document delivery to non-USDA people for the photocopying costs.

Mr. DURBIN. I would like to explore this a little more, when we have more time for both of us to work up some sort of response. This is what I'm driving at.

I would personally like to know, and perhaps some other members of the subcommittee have a little different spin on this, but I would like to know what we might charge non-governmental entities for the actual cost of document delivery and what the result would be to your budget.

Ms. ANDRÉ. We would be happy to explore that and make that information available.

[Additional information follows:]

NAL has a user fee structure for document delivery service which we are currently reviewing with a view to modifying the rate from the current variable rate to a straight per item charge, and raising the rate charged overall. Only a small percent of our document delivery services is for users who are billed. This means that while we can raise our user fees, the total amount of increased revenue available to NAL would be very modest when viewed in the context of our overall needs.

DOCUMENT DELIVERY SERVICES—FEES CHARGED

Mr. DURBIN. You are requesting an increase of \$281,000 to cover increased costs of document delivery service. Costs are increasing due to user demand and intense labor needed to service requests. Since you already have the authority to charge a fee to cover these costs, why don't you pursue this option?

Ms. ANDRÉ. NAL does charge a fee to most categories of non-USDA users for photocopies, copies of microfiche, and copies of microfilm. However, these fees are not charged to USDA users, who make up approximately 60% of the overall user population.

DOCUMENT DELIVERY SERVICES—USAGE AND COST

Mr. DURBIN. Provide a table showing the number of requests received and filled, and the amount spent and recovered for document delivery services for the last five fiscal years, including estimates for fiscal year 1994. Also, provide a similar table showing the same information for non-government requests only.

Ms. ANDRÉ. We have included another row in the "NAL Document Delivery Services Activity and Cost" table to show the total amount recovered through fees, in response to part a. of the question. In regard to the second part of the question, we do not have the same information for non-government requests only.

[The information follows:]

NAL DOCUMENT DELIVERY SERVICES ACTIVITY AND COST

	Fiscal year—					
	1989	1990	1991	1992	1993	1994 estimated ¹
Requests Received	221,195	241,678	256,416	237,190	227,738	235,000
Requests filled ²	193,777	193,742	204,688	189,101	182,763	190,500
Amount Spent (Millions)	\$1.79	\$1.85	\$2.18	\$2.3	\$2.3	\$2.4
Amount Recovered (Millions)	\$0.28	\$0.30	\$0.35	\$0.33	\$0.32	\$0.38

¹ Estimates based on current rate of demand for document delivery services.

² Includes document delivery requests filled at NAL; regional document delivery requests filled; and inter-library loan requests filled.

DOCUMENT DELIVERY—CHANGE IN USER FEES

Mr. DURBIN. What is the process the Library must go through to implement user fees to cover the full cost of document delivery service to non-government users? What is the timeframe for this process?

Ms. ANDRÉ. Obtaining approval to change user fee rates for document delivery services would require a notification in the *Federal Register*, followed by appropriate time for public comment. Assuming no adverse comments or other objections are received, we estimate that the entire process—from the internal Departmental review and clearance stage to a final implementation—would take a minimum of one year to complete.

LAND-GRANT UNIVERSITIES—DOCUMENT DELIVERY COSTS

Mr. DURBIN. Do land-grant universities charge a user fee for document delivery costs? If so, does it cover the entire cost of services?

Ms. ANDRÉ. Yes, it is our understanding that the land-grant university libraries charge user fees for document delivery services. It is also our understanding that, typically, the fees charged do not fully recover the costs involved.

As general background, we note that a June 1993 study of interlibrary loan costs issued jointly by the Association of Research Libraries and the Research Libraries Group, indicates that the average cost to a lending library of completing a request is \$11.00, while the fees recovered from photocopying charges average approximately \$8.00 per request.

JOURNALS-COSTS

Mr. DURBIN. Let me take this from another angle. It appears what is eating you alive here, and you have just testified to this,

is the cost of agricultural and scientific journals and subscriptions increasing 10 to 17 percent a year.

Is the Library providing information to people at these journals free of charge if the request can be filled under the one hour time limit?

Ms. ANDRÉ. You're asking if we provide information to journal publishers.

Mr. DURBIN. Or those who write for the journals.

Ms. ANDRÉ. You are asking if we provide information to journal publishers in terms of photocopies of materials in their published publications.

Mr. DURBIN. Let's assume that I'm a researcher writing for a scientific journal.

Ms. ANDRÉ. Right.

Mr. DURBIN. I would most likely from time to time call the Library, and ask for some information as I prepare that article.

Ms. ANDRÉ. That is correct.

Mr. DURBIN. Is that a fair statement?

Ms. ANDRÉ. Yes, we work with the research community.

Mr. DURBIN. Okay.

Ms. ANDRÉ. I think what I didn't understand about your question is we don't have direct connections with the publishers.

Mr. DURBIN. Understood.

Ms. ANDRÉ. Yes, absolutely, we work with the research community, and those researchers then put forward their papers for publication.

Mr. DURBIN. I'm trying to rationalize in my mind how we can be providing the basic information researchers need to write their articles to be published, and then the publishers keep increasing the costs of these journals to us.

So we give researchers free information, they put it in published form and keep raising the cost of subscriptions 10 to 17 percent a year.

Ms. ANDRÉ. Yes, this is the issue.

Mr. DURBIN. Am I missing something here?

Ms. ANDRÉ. No, you're not. This is an issue that research universities are grappling with in the same way that we are grappling with it here. There's a concern that U.S. dollars pay for the research and then U.S. dollars have to pay to purchase the published research results.

Although on the other hand, research that's published with U.S. dollars, my understanding is that it is not copyrighted, so it's not clear to me what the relationship is with the publisher in terms of how they charge for that.

Mr. DURBIN. Would it be fair for us to say that if there is a researcher who receives, federal assistance from the USDA to compensate him or her for the research and publication, that in fact, a copy of the final research product be provided to the USDA National Agricultural Library without cost?

Ms. ANDRÉ. I think that would be an excellent way to do it.

Mr. DURBIN. I think you may see that. Can you give us some reasons why the price of journals in science and technology continues to post higher rates of increase over other broad subject areas?

Ms. ANDRÉ. The amount of published research in agriculture, science, and technology, is rapidly increasing. Many journals have increased the numbers of pages, issues, and supplements to accommodate the greater volume of papers submitted for publication. As sub-disciplines emerge within the broad sciences, the journals have become increasingly specialized, and many journals have split into more specialized ones. Further, the university and academic community in these fields, which tend to remain well-funded in comparison to those in the social sciences and humanities, often are advised to "publish or perish." To accommodate the publication of this research material, many new journals have been initiated, and often a publisher's older, more established journals subsidize the newer ventures.

There is also a very strong market for scientific and technical journals among researchers in both the public and private sectors—both of which have been referred to as "price insensitive" by publishers. Also, government research and development funding enables scientists both to publish more research findings, and to purchase more scientific information to facilitate their research. In addition, since World War II, the established European publishing firms, with support from their governments, have made significant strides in increasing their market share, using firm financial bases to move into the lucrative science and technology information market. When the exchange rate is disadvantageous to the U.S. dollar, the price of journal subscriptions established in foreign currencies increases by a much larger percentage to U.S. subscribers.

Mr. DURBIN. There is a big issue involving the Library of Congress now and the access of people to reading rooms and proposed sit-ins.

Is the same thing happening at your Library?

Ms. ANDRÉ. No, actually we have hours five days a week. We do not have hours on weekends. We have no plans to close during the week, so I would hope we don't have any sit-ins in Beltsville.

Mr. DURBIN. I hope you don't either.

USDA PROPOSED REORGANIZATION

Under the Secretary's proposed reorganization, the Library would be merged with the Agricultural Research Service, Cooperative State Research Service, and the Extension Service to form a new Agricultural Research and Education Service. What impact will this merger have on your operations?

Ms. ANDRÉ. Under the Secretary's proposed reorganization, the National Agricultural Library will maintain its organizational title and identity thus enabling it to fulfill its mandated dual role to serve as the Departmental library and a National library. NAL's placement within ARES will more closely link the Library to key user groups and should facilitate the advancement of partnerships with other providers of agricultural information nationally and internationally.

NAL BUDGET REQUEST

Mr. DURBIN. What was your budget request to the Secretary, what was the Secretary's request to OMB, and what was the OMB allowance?

Ms. ANDRÉ. The NAL budget request to the Secretary totaled \$27,084,000. The Secretary's request to OMB totaled \$19,663,000. The OMB allowance totaled \$19,620,000.

NAL STORAGE SPACE

Mr. DURBIN. The budget request for fiscal year 1995 includes an increase of \$400,000 to implement a National Storage and Preservation Program. Mr. Howard testified last year that the Library would exhaust its storage capacity in three years. You have testified that the Library's collection grows by about 20,000 volumes per year. To reduce the amount of storage space needed, you plan to miniaturize the Library's collection. Will you be able to accomplish this within existing space or will you need to rent additional space? If so, how much of the increase will be used for storage rental?

Ms. ANDRÉ. The requested \$400,000 increase for the National Storage and Preservation Program will be used to miniaturize selected portions of the Library's collection. The miniaturization activities will not require NAL to obtain additional storage space for books, and no funds will be used for storage rental during FY 1995. However, since books are being acquired at a faster rate than they can be miniaturized at this time, NAL may have a need to rent book storage space in future years.

TEXT DIGITIZING—EXPENDITURES

Mr. DURBIN. How much have you spent to date on text digitizing?

Ms. ANDRÉ. The text digitizing pilot project ran from fiscal year 1988 through fiscal year 1991. During that 4-year period, NAL spent approximately \$400,000 on text digitizing activities, of which approximately \$350,000 reflects the cost of staff time directed towards this effort. Additional funding for the pilot project was provided by the land-grant university libraries and by the USDA Assistant Secretary for Science and Education through the Evaluation Studies Program.

From fiscal year 1992 to the present, we estimate that we have spent an additional \$370,000 on these activities, of which approximately \$260,000 reflects the cost of staff time.

PRESERVATION OF AGRICULTURAL INFORMATION

Mr. DURBIN. Would you explain in further detail how you envision the preservation of agricultural information to be a national cooperative effort?

Ms. ANDRÉ. During fiscal year 1993, the plan for a National Preservation Program for Agricultural Literature was developed by a panel of national experts representing NAL, the United States Agricultural Information Network, and the land-grant university and other major agricultural libraries. The national preservation plan calls for the formation of a National Agricultural Literature Archive to be housed at NAL. The goal of the Program is to preserve the most important agricultural literature in its original or in an archivally sound format and make it accessible to researchers and scientists. The preservation effort is to be accomplished cooperatively through a series of nationally organized and coordinated

projects based at NAL, land-grant institutions, and at other libraries, societies, and archives with important collections. The cooperative projects, as envisioned in the National Preservation Plan will be provided for the record.

[The information follows:]

Federal Documents—National Agricultural Library.

Pre-1862 Monographs and Serials—National Agricultural Library.

Scholarly Monographs/Journals—Albert Mann Library, Cornell University.

Popular and Trade Journals—University-based initiatives.

State and County Documents—State responsibility, coordinated nationally.

Unique Collections/Archives and Manuscript Materials/Non-print Collections and Audiovisual Materials—local initiatives.

PRESERVATION OF AGRICULTURAL INFORMATION—COST

Mr. DURBIN. What would the total cost be to preserve all information at the Library electronically?

Ms. ANDRÉ. NAL has not determined the cost of electronically preserving all the information in its collection. Part of the reason is that we do not envision digitizing the collection, in its entirety, in the foreseeable future, and any cost estimate that might be valid today would be very short-lived. Further, arriving at such a figure with a reasonable degree of accuracy is complicated by the difficulty in projecting an average cost for related expenditures which might be necessary to prepare a volume for digitization, especially if it is deteriorated. Nevertheless, we have been able to make some cost determinations by pricing selected, discrete segments of the NAL collection. In these cases, we have estimated the cost of creating a CD-ROM containing 7,000 pages of optically-scanned materials stored as images can range from a low of \$13,000 for a CD-ROM that provides minimum-level access suitable for such activities as electronic document delivery to a high of \$43,000 for one that includes state-of-the-art retrieval software and descriptive indexing.

INTERNET

Mr. DURBIN. Throughout your statement and the explanatory notes, you keep referring to the Internet. Would you describe in detail what that is?

Ms. ANDRÉ. The Internet—a worldwide computer network—is rapidly becoming the preeminent national and international information marketplace. An outgrowth of an experimental U.S. Department of Defense network established in the 1970's, the network was originally designed to support military research. However, the value of such computer-linking technology outside the defense environment soon became apparent. As a result, the National Science Foundation created a new network called NSFNET, based on the same technology and standards. The NSFNET links the university and research community throughout the United States. The success of these initiatives is clearly evidenced by the astonishing growth of what has come to be called the "Internet".

Today, the Internet is an international network of computer networks, all members of which share a common network communication protocol known as TCP/IP. Based on a January 1994 appraisal, it is estimated that the Internet consisted of 20,539 constituent networks. Those networks, in turn, are estimated to include a total of 2,217,000 individual computers, which range in size from micro-computer to supercomputer. Approximately 62 countries worldwide now have Internet connectivity, and it has been estimated that the Internet is currently accessible to 20 million people throughout the world.

COMMUNICATIONS, UTILITIES AND OTHER RENT COSTS

Mr. DURBIN. Why do you project a \$300,000 increase in communications, utilities, and other rent costs from fiscal year 1993 to fiscal year 1994?

Ms. ANDRÉ. In fiscal year 1993, NAL received a credit for \$219,445 to the budget account covering communications and utilities—NAL does not have any rent costs. This credit significantly lowered our expenditures for these services in fiscal year 1993, from the fiscal year 1992 costs of \$962,000. Our estimate for fiscal year 1994 reflects the fact that we do not anticipate receiving such a credit in fiscal year 1994.

EQUIPMENT COSTS

Mr. DURBIN. Also, why do equipment costs increase so dramatically from fiscal year 1993?

Ms. ANDRÉ. As permanent additions to the NAL collection, the books and journals purchased by NAL are properly classified in the budget object classification code for equipment. In prior fiscal years, the books and journals purchased for the NAL collection had been posted to the budget object classification code for supplies and materials, which is intended to include purchases of materials which are used and eventually discarded. Therefore, we have backed the cost of the books and journals out of the supplies and materials classification, and now show these expenditures as equipment.

RURAL INFORMATION CENTER HEALTH SERVICE—DHHS AGREEMENT

Mr. DURBIN. The Office of Rural Health Policy of the Health Resources and Services Administration, U.S. Department of Health and Human Services—DHHS—has extended the agreement with the Library to continue operation of the Rural Information Center Health Service through fiscal year 1997. The DHHS reimbursement for this Center was decreased from \$567,000 in fiscal year 1993 to \$265,000 in fiscal years 1994 and 1995. Why has this reimbursement decreased?

Ms. ANDRÉ. The DHHS has supported NAL's Rural Information Center Health Service—RICHS—with an average of approximately \$335,000 annually since its inception in 1990. In practice, the amount of reimbursable funding received by NAL from DHHS fluctuates from year to year. We do not know the reason why the DHHS chose to decrease the level of fiscal year 1994 funding from the fiscal year 1993 amount. Our understanding is that the DHHS

intends to continue supporting this program through fiscal year 1997, but that the amount of funding available each fiscal year depends on an annual review by DHHS of its overall needs and resources. We have estimated the fiscal year 1995 level of funding from DHHS by carrying over the fiscal year 1994 amount, since the precise amount of the fiscal year 1995 reimbursable funding from the DHHS is unknown at this time.

Mr. DURBIN. Provide a table showing the amount spent by both the Library and DHHS to operate the Center since it began.

Ms. ANDRÉ. I will provide that information for the record.

[The information follows:]

RURAL INFORMATION CENTER HEALTH SERVICE¹ OPERATING COSTS

Fiscal year	DHHS	NAL
1990	\$107,307	\$19,500
1991	323,754	13,500
1992	400,000	10,000
1993	567,000	10,000
1994	265,000	10,000

¹ The Rural Information Center Health Service (RICHS) is a component of NAL's Rural Information Center (RIC).

ELECTRONIC INFORMATION INITIATIVE—TOTAL FUNDING

Mr. DURBIN. As a result of an intensive internal review and analysis of the issues associated with the Library's ability to manage electronically created and stored information, you are requesting \$1.0 million to implement an electronic information initiative. What is the total level of funding needed to fully implement this initiative?

Ms. ANDRÉ. We estimate that to fully implement the Electronic Information Initiative will require roughly \$15 million dollars, over a ten-year period. The focus during the initial years will be to develop the infrastructure needed to support the access, control, and dissemination of electronic information. Later, emphasis will be placed on obtaining access to full text and scientific databases either through direct purchase or by leasing access rights.

ELECTRONIC INFORMATION INITIATIVE—PROJECTED SAVINGS

Mr. DURBIN. What are the projected net savings of moving from the current paper-based information delivery system to an electronic delivery system, including both dollars and staff-years?

Ms. ANDRÉ. Some savings in the cost of purchasing and handling of paper can be realized from the move away from the current paper-based information delivery system. However, these savings would need to be redirected to support the significantly enhanced information access capability that would be available through an electronic delivery system.

ELECTRONIC INFORMATION INITIATIVE—CONTRACT MODIFICATIONS

Mr. DURBIN. The breakout of the \$1.0 million request includes \$25,000 for contract modifications. Please explain this in further detail.

Ms. ANDRÉ. Under NAL's lending services support contract, the tasks associated with document delivery—receipt and sorting of re-

quests, pulling materials from the shelf, photocopying and mailing the articles, reshelving the materials, etc.—are now performed manually. As a result of implementation of the Electronic Information Initiative, some of the work performed under the contract will require a change from manual to the use of automated systems. Through the use of automated systems, NAL will be able to use CD-ROM's to fill requests by electronically scanning articles which will be sent directly to the patron on the Internet.

To accomplish this, staff skill levels must be enhanced to allow for the use of the equipment and software used. In addition, some electronic publications will be acquired which will enable NAL to cancel and withdraw print copies of the materials. The identification and removal of these print copies from the collection will add an additional set of tasks to the contract.

FOOD AND NUTRITION INFORMATION CENTER

Mr. DURBIN. Please provide for the record the number of calls you received at the Food and Nutrition Information Center, by fiscal year, since 1990.

Ms. ANDRÉ. The information will be provided for the record.

[The information follows:]

Number of calls for information received

Fiscal year:	
1990	15,250
1991	15,408
1992	18,000
1993	18,200

INFORMATION CENTERS—RESOURCES

Mr. DURBIN. Please update the tables that appear on pages 405 and 406 of last year's hearing record showing the resources provided to the Information Centers, to reflect fiscal year 1993 actuals and fiscal year 1994 estimates.

Ms. ANDRÉ. The requested information will be provided for the record.

[The information follows:]

RESOURCES PROVIDED TO NAL INFORMATION CENTERS - FY 1993

Information Center	General Purpose	Appropriated Funds		Reimbursable Funds	Total Resources ²	Staff Years
		Direct to Center	Related Support ¹			
Agricultural Trade & Marketing	Provides information that aids U.S. agribusiness in remaining competitive in the international marketplace	65,086	182,662	-0-	247,748	1.0
Alternative Farming Systems	Offers ideas to agriculturalists interested in lessening the impact of farming on the environment.	56,972	175,085	134,000	366,057	2.5
Animal Welfare	A focal point for those interested in obtaining information on domestic and laboratory animal welfare.	319,134	181,520	-0-	500,654	3.0
Aquaculture	Assists those interested in aquaculture in establishing profitable operations.	109,479	173,311	21,500	304,290	2.5
Biotechnology	Storehouse for current knowledge on genetic engineering, and other scientific data related to farm animals and plants.	79,558	189,212	18,500	287,270	1.5
Food and Nutrition	Maintains and monitors current data on healthy diet and nutrition for all sectors of U.S. society.	214,950	433,605	175,000	823,555	2.0
Rural	Provides information and referral services to local governments and communities to revitalize rural communities.	195,338	297,855	637,182	1,130,375	6.7
Technology Transfer	Assists in getting research results into the hands of those who can put it to practical use.	108,983	109,222	-0-	218,205	1.6
Youth	Supports youth development professionals in meeting the needs of America's youth.	-0-	88,722	66,000	154,722	1.0
Water Quality	Monitors and maintains information on farming's effects on U.S. Water supplies.	88,480	197,627	-0-	286,107	1.0
Plant Genome Information Center	To support the information and data management needs for the USDA Plant Genome Research Program.	-0-	406,422	1,470,000	1,876,422	10.3
	TOTAL	1,237,980	2,435,243	2,522,182	6,195,405	33.1

¹Funding for general NAL activities related to the information center.²Reimbursable funds included in Total Resources.

RESOURCES PROVIDED TO NAL INFORMATION CENTERS - FY 1994

Information Center	General Purpose	Appropriated Funds			Reimbursable Funds	Total Resources ²	Staff Years
		Direct to Center	Related Support ¹				
Agricultural Trade & Marketing	Provides information that aids U.S. agribusiness in remaining competitive in the international marketplace	68,318	203,790		-0-	272,108	1.0
Alternative Farming Systems	Offers ideas to agriculturalists interested in lessening the impact of farming on the environment.	41,499	196,756		175,000	412,755	1.5
Animal Welfare	A focal point for those interested in obtaining information on domestic and laboratory animal welfare.	372,484	193,161		-0-	565,645	3.0
Aquaculture	Assists those interested in aquaculture in establishing profitable operations.	147,334	192,729		41,500	381,563	2.5
Biotechnology	Storehouse for current knowledge on genetic engineering, and other scientific data related to farm animals and plants.	128,797	204,825		18,500	352,122	1.5
Food and Nutrition	Maintains and monitors current data on healthy diet and nutrition for all sectors of U.S. society.	221,989	454,980		202,000	878,969	2.0
Rural	Provides information and referral services to local governments and communities to revitalize rural communities.	203,853	242,490		312,856	759,199	6.7
Technology Transfer	Assists in getting research results into the hands of those who can put it to practical use.	110,190	109,906		-0-	220,096	1.0
Youth	Supports youth development professionals in meeting the needs of America's youth.	-0-	95,302		80,000	175,002	1.6
Water Quality	Monitors and maintains information on farming's effects on U.S. Water supplies.	92,642	192,681		-0-	285,323	1.0
Plant Genome Information Center	To support the information and data management needs for the USDA Plant Genome Research Program.	-0-	515,387		1,710,000	2,225,582	10.2
TOTAL		1,387,106	2,601,207		2,540,051	6,528,364	32.0

¹Funding for general NAL activities related to the information center.²Reimbursable funds included in Total Resources.

INFORMATION CENTERS—SERVICES

Mr. DURBIN. Do you plan to establish any new centers or stop providing services to any existing centers in fiscal year 1994?

Ms. ANDRÉ. No. NAL does not plan to establish any new information centers or to stop providing the services of any existing centers in fiscal year 1994.

NAL USAGE INDICATORS

Mr. DURBIN. Please update the table that appears on page 408 of last year's hearing record on usage indications of the National Agricultural Library to include fiscal year 1993 actuals.

Ms. ANDRÉ. I will provide the information for the record.
[The information follows:]

	Fiscal year—		
	1993	1994 estimated	1995 estimated
Document delivery requests filled at NAL	116,680	119,000	120,000
Regional document delivery requests filled	50,815	53,500	60,000
Interlibrary loan requests filled	15,268	18,000	21,000
Reference requests	52,839	55,000	57,000
Online and CD-ROM database searches	15,525	18,000	20,000
Current Awareness searches	92,176	92,176	92,176

Note.—The table previously separated reference questions into those for information centers and others. Our statistics are now reported only as total reference requests.

REPAIR AND MAINTENANCE

Mr. DURBIN. Last year, you provided the Committee with a list of facility needs and the cost of each project. Please update this list, noting those projects that were completed and the cost of completion.

Ms. ANDRÉ. I will provide for the record a list of completed projects and costs as well as a list of pending facility needs and the estimated cost of each project. The list of pending needs includes major facility projects we anticipate requiring during the next 2–3 years.

[The information follows:]

Completed Projects¹

	Amount
Roof condition survey	\$25,000
South wing/tower reroofing project	650,000
Emergency generator repair	18,000
Freight elevator renovation	140,395
Fire alarm system upgrade	164,170
Energy saving light fixtures (lobby, exit signs, stairways, 4th and 5th floors)	39,094
Install automatic fire doors	20,840
Remove inoperative solar collector prior to reroofing work	18,750

¹ Includes completed work and work in progress during fiscal year 1994.

Major Projects Pending (2–3 years)

	Amount
Restroom renovation (4), drinking fountains (2), handicap modification	\$35,000
Exterior brick/glazing work	250,000
Energy saving light fixtures (4 floors)	50,000
Exterior window caulking repair	50,000
Clean and seal floor in basement	20,000

	<i>Amount</i>
Environmental controls for rare books	250,000
Plumbing modifications	150,000
Repairs to water damaged interior	25,000
Fire/life safety features for high rise building (sprinklers, smoke control, emergency phone system)	580,000
Repave roadway, install curbing	100,000
Energy saving motor controls	75,000
Total	\$1,585,000

BOOK LIFT AND PASSENGER ELEVATOR PROJECT

Mr. DURBIN. Do you still expect the replacement of the book lift and passenger elevator upgrade projects to be completed by the end of this fiscal year?

Ms. ANDRÉ. The book lift and passenger elevator upgrade projects were completed in January 1994.

USDA CENTERS OF EXCELLENCE INITIATIVE

Mr. DURBIN. Please describe in further detail the Department's initiative to establish Centers of Excellence at 1890 land-grant and 1862 land-grant universities. Will each university have a center of excellence established?

Ms. ANDRÉ. This initiative began in 1988 with the objective of improving ties between USDA and the historically black institutions established under the second Morrill Act of 1890. The centerpiece of the effort is the Agricultural Research and Education Service, ARES, Partnership Research Capacity Building Grants program, which is budgeted at \$10.6 million in 1995.

There is strong commitment from USDA to draw on the capabilities of the land-grant universities to carry out programs and activities that meet Departmental needs. When such opportunities are identified, USDA assists in building and supporting a Center of Excellence, usually an on-campus facility dedicated to conducting land-grant missions of research, technology transfer, or teaching involving a specific agricultural subject. Three Centers of Excellence will be established in 1994 and there are four included in the budget requests of participating USDA agencies for 1995.

Overseeing the initiative is the USDA 1890 Land-Grant Universities Task Force. NAL is not a member of that task force. The task force envisions establishing Centers of Excellence at all land-grant universities at the rate of 2-4 universities per year.

While currently not actively involved in the initiative, NAL can support Centers of Excellence by providing agricultural information services in cooperation with land-grant universities.

CENTERS OF EXCELLENCE—LISTING

Mr. DURBIN. Provide a list of all land-grant universities that have a center of excellence or are in the process of establishing one. Tell us what each center's focus is and the total amount of Federal funds and non-Federal funds devoted to each center.

Ms. ANDRÉ. At present, the National Agricultural Library has little involvement with the USDA's land-grant university Center of Excellence initiative. However, we will research the answer to this question and provide the information for the record. As the Centers of Excellence become more active, NAL expects it will provide infor-

mation services to them through land-grant university libraries. NAL has a decades-old information delivery relationship with land-grant university libraries.

[The information follows:]

The USDA 1890 Land-Grant Universities Task Force, which oversees this initiative, provided NAL with the following information. The task force explained that figures on non-Federal funds devoted to each center are not yet available.

CENTERS OF EXCELLENCE ESTABLISHED/PLANNED FEDERAL FUNDS

(Dollars in thousands)

University	Focus	Fiscal year 1994	Fiscal year 1995—Estimated
Alabama A&M University	Forestry	\$2,100	\$2,600
Tennessee State University	Horticulture	500	500
University of Arkansas—Pine Bluff	Aquaculture	125	125
University of Arkansas—Pine Bluff	Regulatory science		200
Prairie View A&M University	World food distribution		1,200
University of Maryland—Eastern Shore	Food safety		750
Lincoln University	Wildlife		575

NAL PROJECT WITH KANSAS STATE UNIVERSITY LIBRARY

Mr. DURBIN. Please describe the work you are doing with the Kansas State University Library in providing training to Extension Service staff in cataloging. What is the status of expanding these efforts to other land-grant universities?

Ms. ANDRÉ. NAL, Kansas State University Library and the Kansas Cooperative Extension Service are conducting a six-month demonstration project which expands the scope of our ongoing state publications program. In this program, NAL and state libraries collect, process, and provide document delivery services for state cooperative extension service and experiment station publications. The state publications are cataloged and indexed in NAL's AGRICOLA database.

In the demonstration project, Kansas State University Library is training Extension Service staff in cataloging, so they may provide minimal level records for Extension Service publications as soon as they are produced. This means a cataloging record will be input into the local library system as soon as possible and contain sufficient information to identify the resource. These records are then enhanced by Kansas State University Library to include NAL-required additions.

NAL will review the records for completeness and accuracy during the demonstration project. NAL will also add the records to our AGRICOLA database, NAL's online catalog, and OCLC, an international bibliographic utility. As a result, access to these publications will be enhanced, and the Cooperative Extension Service staff will have a current, accurate database of the publications they and the experiment stations produce.

The potential expansion of this approach to other land-grant universities is dependent on a review and evaluation of the Kansas State project during fiscal year 1994.

INFORMATION EXCHANGES WITH JAPAN, CHINA, AND CENTRAL EUROPE

Mr. DURBIN. For the record, please describe your activities with regard to information exchanges with Japan, China, and Central Europe.

Ms. ANDRÉ. NAL has been working with its counterparts in Central and Eastern Europe since 1991 when the dramatic political changes that were taking place in the Region afforded a unique opportunity to explore the development of cooperative relationships for improving access to agricultural information. A joint program of cooperation, endorsed by 16 Central and Eastern European agricultural libraries and NAL, is serving as a foundation from which mutually beneficial initiatives can take place and is already resulting in an improved level of publications exchange.

In 1987, NAL signed a Memorandum of Understanding with the Library of the Chinese Academy of Agricultural Sciences (CAAS) in Beijing, China, to cooperate in a program to enhance access to agricultural information. Under the terms of this agreement NAL and CAAS have exchanged publications and staff and engaged in various cooperative initiatives targeted toward making Chinese-language agricultural materials more widely available.

The NAL information exchange efforts with Japan involve primarily aquaculture literature. Staff members of NAL's Aquaculture Information Center coordinate this literature exchange, through which selected documents are donated to Japan each year. In turn, Japan donates a similar amount of materials to the United States, which are inventoried and housed at NAL, and made available for public use.

USE OF AGRICULTURAL INFORMATION BY OTHER COUNTRIES

Mr. DURBIN. Will these countries be able to obtain information that would put U.S. agriculture at a competitive disadvantage?

Ms. ANDRÉ. The NAL collection is comprised of public domain and commercially-available publications. This collection is available to users nationally and internationally as are those of other libraries throughout the world. Of course, the ultimate use that might be made of any information contained within the collection is unknown. However, we believe that a free exchange of agricultural and scientific information benefits all of the countries involved, including the United States.

NAL ASSISTANCE TO EGYPT

Mr. DURBIN. You have been providing assistance to Egypt in their effort to establish an Egyptian National Agricultural Library. Are you providing this assistance on a reimbursable agreement?

Ms. ANDRÉ. Yes, we are providing this assistance through a reimbursable agreement.

Mr. DURBIN. What is the cost of this agreement and when do you expect the work to be completed?

Ms. ANDRÉ. NAL received \$204,576 in reimbursable funding from the USDA Office of International Cooperation and Development (OICD) to reimburse NAL for expenses in support of the Egyptian National Agricultural Library (ENAL). This NAL project is one component of the Participating Agency Service Agreement between

the USDA OICD and the Egypt National Agricultural Research Project (NARP) of the U.S. Agency for International Development.

The work, which entails NAL providing a wide range of training and technical support in library and information science to ENAL staff members, is expected to be completed during fiscal year 1994.

INFORMATION NEEDS AT REMOTE LABORATORIES

Mr. DURBIN. What are the results of a study done to assess the information needs of scientists at remote laboratories that do not have library facilities?

Ms. ANDRÉ. Results of this study indicate that the USDA Agricultural Research Service—ARS—scientists in remote locations utilize a wide variety of information resources in all formats, provided by NAL, the land-grant university libraries, USDA libraries or other resources. While the majority of the ARS scientists have access to a variety of computer resources to support research applications, they do not use computer capabilities to a large extent to access library information systems and resources.

Based on these findings, the study concludes that assistance is needed in obtaining remote access to online library catalogs and searching computer databases; orientation and training on available library services; information resources and systems update; and expansion of their on-site research collections.

NAL, ARS, and land-grant cooperators are working to address these concerns in a number of ways.

One, conducting an electronic access pilot study to identify options for Internet connectivity and other electronic linkages among ARS libraries and remote laboratories without onsite library collections;

Two, providing technical advice and assistance to scientists, administrators and other laboratory staff on the availability and use of a variety of information resources, services, and systems;

Three, identifying and implementing options for connectivity for accessing library online public access catalogs and other various computer systems and resources including the feasibility of electronic document delivery using the Internet.

EQUIPMENT MANUFACTURERS INSTITUTE—TECHNOLOGY EXCHANGE

Mr. DURBIN. What is the status of discussions with the Equipment Manufacturers Institute on technology exchange?

Ms. ANDRÉ. During fiscal year 1993, NAL's Technology Transfer Information Center—TTIC—and the Equipment Manufacturers Institute initiated a project to locate technologies to solve the agricultural industry's priority needs. The TTIC is working with industry representatives and through Federal laboratories to locate potential solutions—either chemical or physical sensors—in six identified problem areas. As a next step, the preliminary findings will be used to determine which problem areas require additional investigation.

UNIFIED WORLD AGRICULTURAL THESAURUS

Mr. DURBIN. What is the status of the development of a unified world agricultural thesaurus?

Ms. ANDRÉ. Together with the Commonwealth Agricultural Bureau, International, U.K., the Food and Agriculture Organization of the United Nations, and the Zentralstelle für Agrardokumentation und -information, Germany, NAL continues to be a key player in the international effort to produce a unified world agricultural thesaurus.

During fiscal year 1993, thesaurus specialists from the cooperating organizations agreed on an approach for unifying the two primary agricultural thesauri—AGROVOC and the CABI Thesaurus—using a single classification system. This agreement represents a major step toward reconciliation of the two thesauri, which is a prerequisite for development of a unified thesaurus. In addition, progress is underway to develop a thesaurus management system to support the unification effort.

Mr. DURBIN. Mr. Walsh.

Mr. WALSH. Thank you, Mr. Chairman. Thank you for your testimony.

ELECTRONIC INFORMATION

This issue of providing information electronically, I'm not sure how local libraries are doing it, but I'm just curious on these journals that you receive, are those journals provided to you in the journal form that they are provided to other customers?

Or is it also provided electronically so that you would get a disc or a tape with that journal on it?

Ms. ANDRÉ. At this point, almost all of the journals that we receive, we receive in printed form. Again, we're in a time of transition. Libraries are in a time of transition. Publishers are also in a time of transition.

Many publishers are currently investigating what it would take for them to provide their material electronically. One of their concerns, as I am sure you are aware, is the cost of that and how they can recoup the royalty fees which will allow them to continue to publish their materials.

So they are moving in that direction, but at this point, we may have one or two journals that we get electronically, and one of those is the extension journal of USDA, so right now there's not a lot of electronic journal material available in the agricultural area.

Mr. WALSH. So if they transmitted that material to you electronically, does that information then become part of the public domain?

Ms. ANDRÉ. Yes.

Mr. WALSH. Then no one is going to buy it from them, right?

Ms. ANDRÉ. Exactly, and that's exactly the problem. One of the things that needs to happen before electronic journals can be made available across-the-board, is that the publishers have some kind of mechanism for recouping their costs, royalties, photocopy costs and all the rest.

Mr. WALSH. Is there any discussion underway now to resolve that vis-a-vis the agricultural library?

Ms. ANDRÉ. There are discussions going on in the general research library community. In fact, there are a number of pilot projects going on in which major publishers like Elsevier are doing cooperative projects with major research universities to try to sort out exactly what the mechanism should be for making material

available electronically in order that the publishers get their full royalty.

We have done nothing to that extent, although I would expect that if we get the million dollars toward the electronic information initiative, that one of the things that we would like to do is establish such a cooperative project with major agricultural publishers because it is clear that a mechanism needs to be found.

Mr. WALSH. Would your customers or clients derive this electronic information through dial-up telephone services, or would they subscribe to an Internet or Prodigy or that sort of service?

Ms. ANDRÉ. We would expect that they could get it through a variety of mechanisms, but what we would hope, and in fact, what is the case right now is that many of our users, particularly in the land-grant community, have Internet access, and so they already have the mechanism available through which we could exchange materials electronically.

Mr. WALSH. Do they pay a fee to subscribe to that service?

Ms. ANDRÉ. I don't know the details of Internet subscription. I would be happy to get that information and provide it for the record.

[The information follows:]

Internet access can be achieved in a variety of ways. Most typical for the university community is access through one of the regional service providers that mediate access to the NSFNET backbone. The university computer network is normally linked to the regional provider through a high speed, dedicated telephone line. The university pays a monthly charge for the telephone line. In addition, it pays annual membership, connection, and maintenance fees to the regional service provider. In this milieu, service provider charges are often a function of university budget size. None of the charges is usage sensitive. Once it is established, the university is free to use the connection to the extent permitted by the capacity of the telephone line and connect the university network to the service provider.

Mr. WALSH. I was just curious because if you are providing that information to them, and they are subscribing via an electronic information service, you're adding value to that information service's product, so it would seem that you could exact some sort of fee from the information service provider to allow them to access your databases.

Ms. ANDRÉ. Yes, I think we could do that, but as I said, that's a mechanism that remains to be worked out.

Mr. WALSH. Yes.

Ms. ANDRÉ. If it were simply that we at NAL had a particular database of information that we developed, we could make it available at no cost, as the Chairman said. That's our preference.

But when we start dealing with electronic information that has been developed by the publisher or by another owner, then there are a variety of legal aspects of that that would need to be worked out. It is not as easy as us getting it electronically for a fee and then giving it out to whomever may want it.

Mr. WALSH. Well, if you currently have a library and somebody sends you a Time magazine, and I don't subscribe to Time magazine, I can go into the Library and sit down in your periodical section and read Time magazine. That doesn't cost me anything.

If Time magazine sent you that text electronically, and I had a terminal in my home and I wanted to read Time magazine and you provided that service to the public, I could dial up and get into your

electronic database and draw that Time magazine text out, it's the same thing.

Ms. ANDRÉ. That's right, but in order for us to allow you that service, to enable you to dial into that, we would have to establish some kind of licensing agreement with the publisher.

Mr. WALSH. That would be different than the agreement that you have now to let someone come into the Library.

Ms. ANDRÉ. For printed publications, absolutely. Yes, very different. The use that is made of materials in libraries, particularly in the area of photocopying, is now done under the fair use guidelines of the copyright law, and one of the things that does not now cover is electronic information.

Mr. WALSH. I see.

Ms. ANDRÉ. That is why there is such a dialogue going on now in terms of just how the publishing community should work with the library community to provide some kind of fair use for electronic information. It is not clear-cut.

Mr. WALSH. To do that would require then enabling legislation for all libraries, not just yours, right?

Ms. ANDRÉ. That's right.

Mr. WALSH. Okay. No further questions.

Mr. DURBIN. Mr. Pastor.

LIBRARY OBJECTIVES

Mr. PASTOR. Thank you, Mr. Chairman. Welcome. Just a couple of questions. In your earlier testimony, you referred to the four broad areas that are represented in your objectives. In one, you are still receiving paper—20,000 volumes, and 22,000 periodicals—so you are still receiving paper, which you have to catalog and process. That's one broad area.

And then you have to miniaturize it. You are in the miniaturizing process of some of these papers. At the same time, you're connecting electronically with other libraries or other users. And, preservation also appears to be one of your objectives.

Taking those four broad categories, what percentage of resources are dedicated to each of the broad objectives of your library?

ACQUISITIONS BUDGET

Ms. ANDRÉ. We have about \$10 million of our appropriations devoted to salary, and the rest of it is spread across the acquisitions area.

Our acquisitions budget—that is getting the material into the library—is about \$1.6 million.

BUDGET IN SUPPORT OF MISSION AREAS

Mr. PASTOR. How does that translate to your total budget? You would say well, in receiving paper and buying magazines, we dedicate X-number of employees and we spend so much money, is that 20 percent of your total mission? Is it 30 percent of your total mission?

Ms. ANDRÉ. The mission is to acquire and store and describe and disseminate and all of that is done with our current appropriations.

About half of what we get currently is staff, and that is staff to do all of those things.

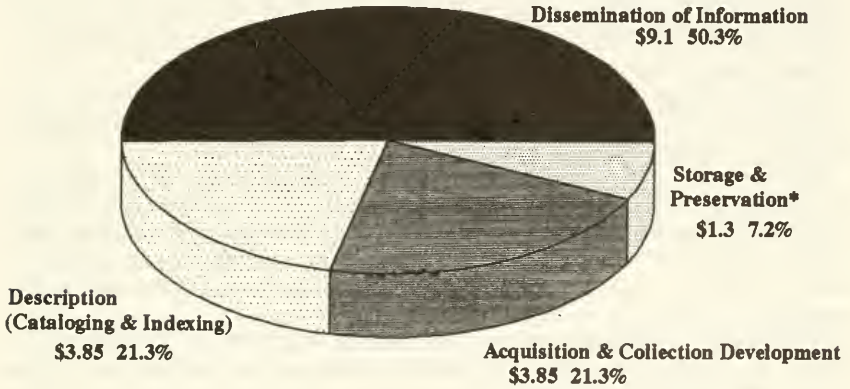
If you would like us to break it down specifically, we can do that and supply that information for the record.

[The information follows:]

National Agricultural Library
Budget Spent in Support of Basic Mission Areas

(Dollars in Millions)

Fiscal Year 1994 Total Budget \$18.1



*Includes \$1.1 Million of building maintenance and utility costs.

Mr. PASTOR. Well, what I'm getting to is that basically you have four missions. You're still going to get paper. You're still going to have to put it on microfilm or electronic devices that permit the best storage.

You are still going to link-up electronically with universities and other users, and, in addition you still will be engaged in preservation activities.

I'm sure you can probably go back and say we have a certain percentage that we are dedicating to any given mission. Yet, in the future, you're going to have less money and fewer people. In view of this, how do you propose to make better use of your electronic outreach capabilities to help ensure that this method of dissemination of materials becomes more commonplace?

So I'm trying to see where you're going to go in the future. How will these four broad objectives allow you to fulfill your mission of receiving, disseminating and preserving information?

Ms. ANDRÉ. Fine. Again, the budget request that we're making this year is to enable us to start making the transition from being a collecting point and a preservation point for paper, to being a collection point and dissemination point for electronic information, although that's not something that's going to happen instantaneously.

We have a collection of over 2 million volumes of material. It's taken us something over 100 years to amass that collection of material. We have to be concerned about preserving that material. We hope that it will not take us 100 years to preserve that material.

What we're asking for is to allow us to take the first steps toward, the electronic environment, starting to preserve the material, and starting to provide access to that material electronically.

Mr. PASTOR. It took you 100 years to get all this material. You have 48 miles of bookshelves. I'm asking if one of your missions is to preserve it, but at the same time, you're trying to miniaturize it, so—

Ms. ANDRÉ. Well, it's—

Mr. PASTOR. You understand. You have four things that you are doing.

PRESERVATION

Ms. ANDRÉ. Yes, the preservation. Excuse me.

Mr. PASTOR. Yes, go ahead.

Ms. ANDRÉ. The preservation process includes miniaturizing. That is, the technique that we propose to use for preservation is putting this material into electronic form.

Mr. PASTOR. Okay, so preservation does not mean taking a book that is published say in 1860 and helping ensure the quality of the paper is protected to maintain its original condition. To me that's preservation.

Ms. ANDRÉ. Okay. In library terms, that's called conservation.

Mr. PASTOR. Oh, all right. [Laughter.]

Ms. ANDRÉ. I am sorry.

Mr. PASTOR. Okay. Let me do this, let me do this. Preservation, I will cross it out—conservation, okay.

Ms. ANDRÉ. Let me explain that just a little bit. What that means is taking steps to conserve the original. There's only a very little bit of the NAL collection that is——

Mr. PASTOR. Worth saving. [Laughter.]

Ms. ANDRÉ. For which the artifact is critically important, that we must keep the artifact. What's important is the information that we have.

Mr. PASTOR. Right.

Ms. ANDRÉ. So we are proposing for those artifacts that we don't feel are historically critical for us to keep, we are proposing to turn the printed material into electronic information, and that is the preservation as well as the miniaturization, as well as the capturing of material in electronic form to provide this electronic access that we're talking about.

Mr. PASTOR. In reality, in the future since you're going to have less money and fewer people, have you tried to anticipate how your mission might change? I mean, you are still receiving a lot of paper and will continue to receive a lot of paper, and a lot of resources will still have to be dedicated to preserving and miniaturizing it. At the same time, it is going to be very difficult and expensive to increase your outreach efforts through the electronic system when resources are diminishing.

Ms. ANDRÉ. That is correct.

Mr. PASTOR. I'm just trying to get a feeling of where you want to go so that as we look to the future, we can gauge how your budget request helps you meet your goals.

PRIORITIES

Ms. ANDRÉ. Well, obviously we have some critical decisions to make in terms of the priority of print materials versus electronic materials. We currently have an effort underway. We are doing strategic planning at the Library to try to focus our direction.

It is very clear that we're going to have less and less reliance on paper, and more and more reliance on the electronic, but we don't have the specific details at this point.

Mr. PASTOR. Maybe when you do have them, you can provide them to us, so at least we know what your problems are going to be.

Ms. ANDRÉ. Yes. Once we have completed the strategic planning process, I would be pleased to provide that information for the record.

Mr. PASTOR. Thank you very much. Mr. Chairman, I yield back.

RESEARCH PUBLICATIONS

Mr. DURBIN. Dr. Plowman, before we leave, let me ask you a question. The concept I was exploring earlier about Federally funded agricultural research leading to publications with the caveat that if you received Federal funding you had to provide that publication to the National Agricultural Library free of charge, what is your reaction to that?

Dr. PLOWMAN. Well, we would have to really explore that. A lot of the publications are developed by the professional societies, and some of the interaction that Pam has is with the professional societies. It is not just the publisher, it is the professional societies that

bring the publications, all the papers together and so on, and put them in.

Mr. DURBIN. But is it unreasonable to say to these professional societies that since we are, in fact, financing the research that furthers science and learning, that we receive the publication from those societies free of charge?

Dr. PLOWMAN. Well, we ought to take a look at it. I can tell you, it would be met with a lot of resistance.

Mr. DURBIN. I expect that.

Dr. PLOWMAN. But I think we ought to take a look at it and see what it might be.

Mr. DURBIN. Every time I talk to anybody in education, the first thing they tell me is how the costs of library materials are eating them alive.

Dr. PLOWMAN. It's true.

Mr. DURBIN. They just can't keep up with it. It strikes me that we have an example where the taxpayer is paying for the research when it's done, and then again when it's published. Someone is profiting from it. I do not see why we should have to pay twice here, and perhaps we can explore that together.

Dr. PLOWMAN. Yes.

Mr. DURBIN. And I hope you will work with us on that idea.

Dr. PLOWMAN. We will. It's an interesting idea. We ought to see what the figures look like.

Mr. DURBIN. Thanks a lot. Thanks for your testimony.

Ms. ANDRÉ. Thank you.

Mr. PLOWMAN. Thank you very much.

BIOGRAPHY**PAMELA Q. J. ANDRÉ
ACTING DIRECTOR
NATIONAL AGRICULTURAL LIBRARY**

Pamela Q.J. André was appointed the Acting Director of the National Agricultural Library (NAL) on February 4, 1994. With 2 million volumes, the National Agricultural Library is the largest agricultural library in the world and is one of three national libraries in the United States.

Prior to her appointment as acting director, Ms. André held the post of Associate Director for Automation at NAL. She was responsible for the management of all aspects of automation and was instrumental in implementing a broad program of applications research utilizing a variety of innovative electronic technologies.

Ms. André held a variety of positions at the Library of Congress before her appointment at NAL in 1984. As a computer systems analyst, she worked on the development of that library's bibliographic computer system. She was later the Assistant Chief of the MARC Editorial Division. In 1982 she was named to the management team for the Optical Disk Pilot Project.

Ms. André received her bachelors degree from the University of New Hampshire and Masters Degree in Library and Information Science from the University of Maryland. She has received many awards during her career including the USDA Special Service Award in 1990 and NAL Special Service Awards in 1989 and 1992.

Her professional activities include serving on the editorial boards of "Library Hi Tech" and "Electronic Networking: Research, Applications and Policy." She is a member of the American Library Association, International Association of Agricultural Information Specialists, and the Library of Congress Network Advisory Committee. She has published numerous articles in the area of library automation and is a noted speaker on the uses of new electronic technologies in libraries.

February 1994

National Agricultural Library

Statement by Ms. Pamela André, Acting Director, National Agricultural Library, before the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies.

Mr. Chairman and members of the Subcommittee, it is a pleasure for me to appear before you to explain the fiscal year 1995 budget request for the National Agricultural Library (NAL).

In my remarks, I'll first give you a short overview of NAL, the scope of our operations and our activities, then I'll talk briefly about what we hope to accomplish with the 1995 budget we are requesting.

The National Agricultural Library is one of three national libraries of the United States, with the Library of Congress and the National Library of Medicine. We were established in 1862 as part of the U.S. Department of Agriculture under legislation signed by President Abraham Lincoln.

That legislation, the Organic Act of 1862, set a mission "to acquire and to diffuse

among the people of the United States useful information on subjects connected with agriculture..." The act further placed upon the Secretary of Agriculture the responsibility to "procure and preserve all information concerning agriculture."

From that beginning until 1969 we were located at USDA Headquarters in Washington, D.C. In 1969, we moved to our current home in Beltsville, MD, next to USDA's Beltsville Agricultural Research Center.

The collection at NAL totals nearly 2.2 million volumes, making us the largest agricultural library in the world. To give you a feel for the scope of our collection, it takes about 48 miles of bookshelves to accommodate that number of volumes. But the collection is not only books. The Library subscribes to about 22,000 periodicals each year. We also have audiovisual materials like photographs, films, slides and posters; research reports and theses; maps; patents; computer software; electronic databases; and artifacts.

NAL has items dating back to the seventeenth century and in 75 different languages. The collection grows by about 20,000 volumes annually. This rate of growth has caused problems for us in recent years as we have run out of space to store materials. However, we are currently taking steps to deal with this problem, including electronically miniaturizing parts of the collection and seeking additional storage space in other locations. I'll talk more about these efforts in a few minutes.

Access to the NAL collection is provided through AGRICOLA, the Library's agricultural union catalog. AGRICOLA, which stands for AGRICultural OnLine Access, is available online or on compact disc and contains over 3 million citations to agricultural literature. It is used by agricultural researchers worldwide and NAL, with help from the land-grant library community, adds thousands of records to it each year.

NAL has a staff of about 210 people which includes librarians, computer specialists, administrators, information specialists and clerical personnel.

A number of the NAL staff work at eleven specialized information centers established by the Library. These centers provide customized information services in areas of particular concern to the world agricultural community. As an example, the intense national activity in the area of plant genome mapping and research has had a tremendous impact on demand for information services from our Plant Genome Data and Information Center. Throughout the year, the staff has been adding new research results to our plant genome database. As a result, this database, which is now available on the Internet, is the most up-to-date one available anywhere. Other subjects covered by information centers are agricultural trade and marketing, alternative farming systems, animal welfare, aquaculture, biotechnology, food and nutrition, rural development, technology transfer, water quality and youth development.

Under the USDA reorganization plan developed by Agriculture Secretary Mike Espy,

NAL will be merged into a new Agricultural Research and Education Service. Other USDA agencies merging with the Library into the new agency will be the Agricultural Research Service, the Extension Service and the Cooperative State Research Service. NAL managers have participated in many of the planning sessions that have been held since last fall pursuant to the USDA reorganization. The proposed reorganization continues the synergistic relationship between the Library and the research and extension functions. It also enables the Library to maintain its distinct identity in fulfilling its responsibilities as a national library.

As I stated earlier, it is the role of NAL to gather, maintain and make accessible agricultural information. We are viewed nationally and internationally as the premiere world resource for agricultural information.

Those we serve include federal, state and local government scientists and officials; farmers; professors, researchers and students at universities and colleges; private scientific and agricultural organizations; business leaders; the news media; the general public and, more and more, foreign agricultural organizations.

As the designated U.S. Center for the international agricultural information system of the Food and Agriculture Organization (FAO) of the United Nations, NAL is actively involved in enhancing global access to agricultural information.

In recent years, NAL has participated in a series of conferences and workshops with agricultural libraries in Central and Eastern Europe and Latin America aimed at improving access to agricultural information produced in these emerging regions of the world. Assistance has also been provided to foreign countries in the development of their library and information systems. Since 1990, NAL has been working with the government of Egypt on the establishment of the Egyptian National Agricultural Library.

The 1990 Farm Bill gave NAL the authority to serve as the primary agricultural information resource of the nation. Various provisions of the Farm Bill formally recognize NAL's responsibility to the public, private, and international agricultural information communities, in addition to the USDA.

The provisions also broadened the Library's responsibility within the research and education communities, directing us to cooperate with and coordinate efforts among public and private sector libraries and information centers in developing an agricultural library and information network.

One of the ways we are currently meeting that responsibility is through planning for an Agricultural Network Information Center (AgNIC). Working with the USDA Extension Service, Iowa State University, Cornell University, the National Science Foundation and network service providers, NAL envisions this network as a distributed

electronic source of agricultural information which will be available over the Internet. While still in its infancy, NAL and other participants nonetheless have high expectations for AgNIC, as a means of enhancing access to agricultural information.

Also related to network building, NAL is the coordinator and primary resource for a nationwide network of state land-grant university libraries and USDA libraries which form a document delivery service that allows interlibrary loan of agricultural materials nationwide.

NAL also works closely with land-grant university libraries in using newly developed and experimental electronic technology to improve access to the nation's agricultural knowledge. Such technologies as Compact Disc-Read Only Memory (CD-ROM), laser discs, computer networks and optical scanning have been used.

A program using this technology that we are particularly proud of, and that has succeeded beyond our early expectations, is called the National Agricultural Text Digitizing Program. Working with land-grants since 1986, NAL has electronically scanned material in key subject areas and placed it on compact discs. These discs were then distributed throughout the land-grant system and to other locations worldwide. This is a significant step in moving toward the electronic library, an institution which can provide access to information regardless of its location. Subjects covered on the discs include aquaculture, acid rain, Agent Orange, selected materials from the papers

library" will require a dramatic shift in the ways in which NAL has traditionally provided information services.

The funds will be used to bring Internet-based information services to users and to create access to NAL information services, such as the AGRICOLA database, on the Internet. Initially, expenditures will focus mainly on infrastructure development. In subsequent years, funding will shift to data access and licensing expenditures necessary to maintaining an electronic library.

Unquestionably, funding of the Electronic Information Initiative will better position NAL to function effectively in today's quickly evolving environment of worldwide, instantaneous access to information.

An increase of \$400,000 is for the preservation and storage of the NAL collection and other valuable agricultural information. As I said earlier, NAL has run out of space at its Beltsville facility to store materials, and yet the collection continues to grow by thousands of items each year. Also, many of the older items in the collection are deteriorating rapidly. Preservation steps must be taken soon or these items could be lost forever. I should mention that the loss of agricultural knowledge through the deterioration of materials is a serious problem throughout the world, and the world is looking to NAL for answers to the problem.

of George Washington Carver and home landscaping. We also worked closely with the American Society of Agronomy in producing a disc containing issues of the Agronomy Journal dating from 1907 to 1924. Other discs are currently being developed.

This is just a brief sketch of the Library's activities, responsibilities and resources but I hope it will give some idea of the direction in which NAL is heading. Knowing that direction will help you understand our budget needs as I next move on to talk specifically about the Library's fiscal year 1995 budget request.

For fiscal year 1995, NAL is requesting funding in the amount of \$19,620,000. This represents a net increase of \$1,465,000 over fiscal year 1994 appropriations and reflects decreased funding for some NAL activities and increased funding for others. As you will see, there is a strong emphasis on electronic information in our proposal.

An increase of \$1,000,000 is being requested for our Electronic Information Initiative. The world of information management is changing daily. The current paper-based information delivery system is inadequate to keep pace with the needs of the modern agriculturalist. Increasingly, information is produced in digitized form, and with recent telecommunications innovations and the Internet, the computer resources available to users are expanding exponentially. The length of time expended for traditional publication, procurement, physical handling, indexing and document delivery processes is no longer adequate. The transition from a print-based collection to the "electronic

The \$400,000 increase for storage and preservation would be used to establish a National Storage and Preservation Program for agricultural literature which would begin the task of miniaturizing and preserving the library collection. The use of optical scanning to store and preserve information is at the forefront of current information management and access technologies.

The funds would help us implement a strategy to preserve and store information in electronic form. We envision this process as a national cooperative effort involving NAL, the U.S. Agricultural Information Network (USAIN), land-grant institutions and other libraries, societies and archives. In a USAIN sponsored study entitled "A National Preservation Program for Agricultural Literature," NAL was urged to take a leadership role in directing preservation efforts aimed at transferring agricultural literature into digital formats.

An increase of \$398,000 is requested to cover the inflationary rise in the costs of journals purchased for the NAL collection. About 80 percent of NAL acquisition funds are used to purchase subscriptions to agricultural and scientific journals. These journals typically contain the results of current research projects that USDA scientists use and rely on in their own research. Subscription prices to most journals have increased by an average of 10 percent annually since 1984. The price for journals on special topics like biotechnology, for example, have increased by nearly 17 percent in one year alone. NAL believes that the cost of maintaining its journal collection will rise by a minimum

of 10 percent in fiscal year 1995. The proposed \$398,000 increase would partially cover this rise.

An increase of \$281,000 would cover the rise in the costs for NAL's document delivery services. User demand for NAL document delivery services continues to increase.

Labor costs for these services is also rising. NAL's ability to provide users with the latest agricultural information through its document delivery services is a key to the continued success of the nation's agricultural research program. With our information, scientists can build upon past research rather than duplicating research that has already been done. NAL needs the increase to ensure that we can meet our responsibility to provide documents to those who need them when they are needed.

Finally, an increase of \$99,000 would go to meet pay costs associated with maintaining the existing staffing level at NAL.

One of the proposed decreases in funding would come from a cut of \$251,000 in NAL administrative expenditures. This decrease in administrative costs is in keeping with the President's Executive Order to promote the efficient use of administrative resources. The savings will be realized through the careful monitoring of supply and furniture purchases, decreasing consulting services, reducing utility costs by closely monitoring the NAL building temperature and installing energy efficient lighting, and reducing the personnel training budget.

Next, NAL proposes a decrease of \$462,000 for the Leflar School of Law at the University of Arkansas, reflecting the discontinuation of funding for a grant to the Leflar School's Agricultural Law Library.

Within constrained resource levels, we feel that the most effective use of funding would be the investment in the storage and preservation and the electronic information initiatives that we have discussed.

With the funding we have requested for fiscal year 1995, NAL feels that we will be able to continue to collect, maintain and provide agricultural information, even as we work to comply with demands that federal agencies curtail nonessential services and reduce costs where possible. NAL has always prided itself in getting the most from its budgets. I assure you that we will continue to do so.

Thank you. I would be happy to respond to any questions.

NATIONAL AGRICULTURAL LIBRARY

Purpose Statement

The mission of the National Agricultural Library (NAL) was outlined by the Organic Act of 1862, which established the Department of Agriculture. The act, as amended, sets forth a mission, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture, rural development, aquaculture and human nutrition, in the most comprehensive and general sense of the word," and placed upon the Secretary the responsibility to "procure and preserve all information concerning agriculture, rural development, aquaculture, and human nutrition, which he can obtain by means of books."

NAL serves as the Nation's chief agricultural information resource. It provides agricultural information products and services through traditional library functions and through modern electronic dissemination to agencies of the USDA, public and private organizations, and individuals. NAL coordinates a national network of public and private libraries consisting of the land-grant colleges and universities, other state supported colleges and universities with agriculturally-related programs, other public organizations, industry, and other private sector organizations. The NAL provides a leadership role in U.S. participation in international agricultural library and information systems and in efforts to promote worldwide availability of agricultural information.

NAL has as its ultimate purpose facilitating access to and use of information about agriculture and related sciences by all those who need the information. In addition to providing traditional library services such as bibliographies, reference services and document delivery to agricultural scientists and researchers, NAL is expanding its role and serving a wider audience by using modern information dissemination technology to its fullest. The Library emphasizes service to the agricultural community, which includes Federal, State, and private researchers, scientists and administrators; agricultural extension and education personnel; farmers and businessmen; public and private associations and institutions; and the general public.

With approximately 2.1 million volumes of printed material on agriculture and supporting scientific disciplines, NAL has one of the largest collections of its kind in the world. Primarily current, but also historical information is collected and organized for effective utilization by a wide range of users, and is cataloged or indexed in AGRICOLA, the NAL database of over 3 million citations to agricultural publications. NAL also provides extensive input of U.S. publication records to AGRIS, the cooperative agricultural database of the Food and Agriculture Organization of the United Nations.

The principal operations of NAL are located in the NAL Building in Beltsville, Maryland. Specialized reference services are also provided from a reference center in Washington, D.C. Service is provided from both these locations as well as 18 USDA field libraries and 38 smaller USDA centers containing a total of approximately a quarter of a million volumes.

As of September 30, 1993, NAL employment was 202 permanent full time and 29 other than full time employees. With the exception of five employees stationed in Washington, D.C., all are located in Beltsville, Maryland.

In accordance with the proposed reorganization, this agency will be merged into the new Agricultural Research and Education Service.

NATIONAL AGRICULTURAL LIBRARY
Available Funds and Staff-Years
1993 Actual and Estimated, 1994 and 1995

	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
National Agricultural Library	\$17,715,000	196	\$18,155,000	190	\$19,620,000	190
<u>Obligations under other</u>						
<u>USDA appropriation:</u>						
Agricultural Marketing Service:						
Space in NAL Building...	14,719	---	17,680	---	17,680	---
Postage.....	2,000	---	1,460	---	2,000	---
Current Awareness Literature Service....	4,066	---	3,652	---	3,650	---
Dun & Bradstreet.....	1,336	---	1,447	---	1,500	---
Agricultural Research Service:						
Plant Genome Data & Information Center....	1,470,000	10	1,710,195	10	1,700,000	10
Computer Room Support...	126,646	---	132,737	---	133,000	---
Subscriptions Costs....	10,868	---	10,868	---	11,000	---
Evaluation Study-Electronic Info.....	100,000	---	---	---	---	---
Evaluation Study-Food Irradiation.....	50,000	---	---	---	---	---
Aquaculture Guide.....	8,000	---	---	---	---	---
AGRICOLA Indexing.....	2,500	---	---	---	---	---
Current Awareness Literature Service....	579,814	4	594,407	4	595,000	4
Agriculture Stabilization and Conservation Service:						
Dun & Bradstreet	565	---	2,770	---	2,770	---
Animal & Plant Health Inspection Service:						
Current Awareness Literature Service....	33,703	---	33,428	---	34,000	---
Cooperative State Research Service:						
Computer Room Support...	9,234	---	10,234	---	10,234	---
Dun & Bradstreet.....	1,613	---	1,496	---	1,500	---
Aquaculture Info.....	15,000	---	---	---	---	---
Postage & Mail Service...	5,700	---	4,100	---	4,100	---
Space in NAL Building...	20,499	---	20,499	---	20,500	---
National Biological Impact Assessment Program.....	18,500	1	18,500	1	18,500	1
Alternative Farming Information Center....	134,000	1	110,000	1	110,000	1
Extension Service:						
Current Awareness Literature Service....	14,830	---	14,642	---	14,700	---
Youth 4-H Info. Ctr.....	70,000	1	82,000	1	82,000	1
Aquaculture Info.....	3,500	---	3,500	---	3,500	---
Food and Nutrition Service:						
Lending Service.....	110,000	---	110,000	---	110,000	---

NATIONAL AGRICULTURAL LIBRARY
Available Funds and Staff-Years
1993 Actual and Estimated, 1994 and 1995

	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Year
Foreign Agricultural Service:						
Dun & Bradstreet.....	3,440	---	3,874	---	3,874	---
Forest Service:						
Current Awareness						
Literature Service...	11,253	---	11,810	---	11,810	---
Dun & Bradstreet.....	647	---	255	---	255	---
Indexing Service.....	45,465	1	---	---	---	---
Rural Info. Center.....	10,000	---	---	---	---	---
Food Safety & Inspection Service:						
Current Awareness						
Literature Service...	8,645	---	8,825	---	8,825	---
Food Irradiation.....	15,000	---	---	---	---	---
National Exchange for						
Food Labeling.....	---	---	12,000	---	12,000	---
Human Nutrition						
Information Service:						
Current Awareness		---				
Literature Service...	9,784	---	9,305	---	9,305	---
National Finance Center:		---				
Dun & Bradstreet.....	2,549	---	1,788	---	1,790	---
Office of International Cooperation and Development:		---				
Assist Baltic Republic.	3,000	---	3,000	---	---	---
Assist Lithuanian		---				
Librarians.....	450	---	450	---	---	---
Assist Egypt Library...	7,960	---	---	---	---	---
Office of the Inspector General:						
Dun & Bradstreet.....	2,108	---	2,814	---	2,815	---
Packers and Stockyards Administration:		---				
Dun & Bradstreet.....	759	---	890	---	890	---
Rural Development Administration:		---				
Rural Information.....	52,856	---	56,030	---	56,000	---
Rural Electrification Administration:		---				
Dun & Bradstreet.....	9,494	---	8,139	---	8,140	---
Soil Conservation Service:		---				
Current Awareness						
Literature Service...	14,363	---	17,100	---	17,100	---
Office of Operations:						
Dun & Bradstreet.....	---	---	754	---	754	---
Miscellaneous						
Activities.....	---		266,351	---	277,808	---

NATIONAL AGRICULTURAL LIBRARY
Available Funds and Staff-Years
1993 Actual and Estimated, 1994 and 1995

	1993 Actual		1994 Estimated		1995 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Total, Other USDA Appropriations.....	3,004,866	18	3,287,000	17	3,287,000	17
Total, Agricultural Appropriations.....	20,719,866	213	21,442,000	207	22,907,000	207
<u>Other Federal Funds:</u>						
Department of Commerce, National Oceanic and Atmospheric Administration:						
Global Warming.....	5,000	---	---	---	---	---
National Technical Information Service:						
Sale of Photocopies...	28,000	---	48,000	---	48,000	---
Department of Defense, Defense Technical Information Center:						
Global Warming Info...	2,000	---	---	---	---	---
Health and Human Services:						
Rural Health Information..	567,000	2	265,000	2	265,000	2
Total, Other Federal Funds..	602,000	2	313,000	2	313,000	2
<u>Non-Federal Funds:</u>						
Catfish Farmers of America:						
Aquaculture Publication...	500	---	---	---	---	---
Food and Agriculture Organization of the United Nations:						
Assist Baltic Republics...	3,000	---	---	---	---	---
Dev. of Ag. Thesaurus.....	50,000	---	---	---	---	---
Oregon State University:						
Directory of Rural Studies, Scholars, and Educators and Rural Studies Bibliography.....	12,500	---	---	---	---	---
University of Mississippi:						
Food Service Education....	43,000	---	43,000	---	---	---
Miscellaneous Contributed Funds.....	---	---	57,000	---	100,000	---
Total, Non-Federal Funds	109,000	---	100,000	---	100,000	---
Total, National Agricultural Library	21,430,866	216	21,855,000	209	23,320,000	209

UNITED STATES DEPARTMENT OF AGRICULTURE
 NATIONAL AGRICULTURAL LIBRARY
PERMANENT POSITIONS BY GRADE AND STAFF-YEAR SUMMARY
1993 and Estimated 1994 and 1995

GRADE	1993	1994	1995
	HEADQUARTERS	HEADQUARTERS	HEADQUARTERS
ES-5	1	1	1
GS/GM-15	3	3	2
GS/GM-14	10	10	10
GS/GM-13	26	26	27
GS-12	60	59	59
GS-11	25	24	24
GS-10	1	1	1
GS-9	2	2	2
GS-8	5	5	5
GS-7	33	33	33
GS-6	35	35	35
GS-5	9	9	9
GS-4	3	3	3
GS-1	2	2	2
<u>Total, Permanent Positions</u>	215	213	213
Unfilled Positions, End of Year	-4	-4	-4
Total Permanent Employees, End of Year	211	209	209
<u>Staff-Years:</u> Ceiling	216	209	209

NATIONAL AGRICULTURAL LIBRARY

CLASSIFICATION BY OBJECTS1993 and Estimated 1994 and 1995

	<u>1993</u>	<u>1994</u>	<u>1995</u>
Personnel Compensation			
Headquarters.....	\$9,020,000	\$9,164,000	\$9,622,000
11 Total Personnel Compensation.....	7,570,000	7,711,000	8,092,000
12 Personnel Benefits	1,445,000	1,453,000	1,530,000
13 Benefits for Former Personnel.....	5,000	--	--
Total Pers. Comp. & Benefits.....	<u>9,020,000</u>	<u>9,164,000</u>	<u>9,622,000</u>
Other Objects:			
21 Travel.....	145,000	150,000	150,000
22 Transportation of Things.....	74,000	50,000	50,000
23 Communications, Utilities and Other Rent.....	681,000	911,000	980,000
24 Printing and Reproduction.....	245,000	100,000	100,000
25 Other Services.....	3,917,000	3,650,000	3,635,000
26 Supplies and Materials.....	1,863,000	950,000	960,000
31 Equipment.....	824,000	2,769,000	3,628,000
41 Grants.....	895,000	462,000	495,000
Total Other Objects	<u>8,644,000</u>	<u>9,042,000</u>	<u>9,100,000</u>
Total Direct Obligations	<u>17,644,000</u>	<u>18,206,000</u>	<u>19,620,000</u>
<u>Position Data:</u>			
Average Salary, ES Position	\$111,800	\$116,529	\$96,830
Average Salary, GS/GM Positions	\$35,209	\$37,072	\$38,903
Average Grade GS/GM Positions	9.7	9.7	9.7

NATIONAL AGRICULTURAL LIBRARY

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

National Agricultural Library

For necessary expenses of the National Agricultural Library [\$18,155,000] \$19,620,000: Provided, That this appropriation shall be available for employment pursuant to the second sentence of section 706 (a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$35,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That not to exceed \$900,000 shall be available pursuant to 7 U.S.C. 2250 for the alteration and repair of buildings and improvements [: Provided further, That \$462,000 shall be available for a grant pursuant to section 1472 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3318), in addition to other funds available in this appropriation for grants under this section].

The change deletes language providing funds for a grant under section 1472 which in FY 1994 was made to the Leflar School of Law, University of Arkansas, Fayetteville, Arkansas.

NATIONAL AGRICULTURAL LIBRARY
SALARIES AND EXPENSES -- CURRENT LAW

Appropriation Act, 1994.....	\$18,155,000
Budget Estimate, 1995.....	<u>19,620,000</u>
Increase in Appropriation.....	<u>+1,465,000</u>

SUMMARY OF INCREASES AND DECREASES
(On basis of adjusted appropriation)

<u>Item of Change</u>	<u>1994</u> <u>Estimate</u>	<u>Pay</u> <u>Cost</u>	<u>Other</u> <u>Changes</u>	<u>1995</u> <u>Estimate</u>
Inflation.....	-0-	-0-	+\$398,000	\$398,000
Document Delivery.....	-0-	-0-	+281,000	281,000
Administrative Overhead Reduction.....	-0-	-0-	-251,000	-251,000
Leflar School of Law.....	\$462,000	-0-	-462,000	-0-
National Storage and Preservation.....	-0-	-0-	+400,000	400,000
Electronic Information....	-0-	-0-	+1,000,000	1,000,000
All Other.....	<u>17,693,000</u>	<u>+\$99,000</u>	<u>-0-</u>	<u>17,792,000</u>
Total Available	<u>18,155,000</u>	<u>+99,000</u>	<u>+1,366,000</u>	<u>19,620,000</u>

PROJECT STATEMENT- CURRENT LAW
(On basis of adjusted appropriation)

	<u>1993 Actual</u>		<u>1994 Estimated</u>		<u>Increase or Decrease</u>	<u>1995 Estimated</u>	
	<u>Amount</u>	<u>Staff Years</u>	<u>Amount</u>	<u>Staff Years</u>		<u>Amount</u>	<u>Staff Years</u>
1) Agricultural Library Services for Research & Education..	\$16,851,000	197	\$17,255,000	191	(1) +\$1,465,000	\$18,720,000	191
2) Repair & Maintenance of Facility	813,000	---	900,000	---	-0-	900,000	---
Unobligated Balance....	51,000	---	---	---	---	---	---
Total Available or Estimate...	\$17,715,000	197	\$18,155,000	191	+\$1,465,000	\$19,620,000	191
Total, Appropriation..	\$17,715,000	197					

National Agricultural Library

Explanation of Programs

The basic function of the National Agricultural Library (NAL) is to identify, acquire, organize, preserve, and disseminate pertinent food and agriculture information to all scientists, researchers, administrators, and others working in agricultural fields in both the government and private sectors. To meet user needs, NAL cooperates with libraries at land-grant universities and other institutions in the development of a network to enhance access to information. NAL also maintains an extensive collection of agricultural publications and provides access to these publications through AGRICOLA, its master bibliographic database. NAL also provides current awareness and retrospective searches on worldwide agricultural literature through other computer-based systems of interest to agricultural scientists and educators.

New technologies and systems of networking that contribute to making it possible for the user to have faster, more sophisticated, and more cost effective access to information are at the forefront of NAL's initiatives.

One essential NAL program involves advanced information technologies. NAL has intensified its efforts to enhance and expand its information-providing capabilities by testing new electronic technologies, including computer-based video technology, and recently developed optical scanning, laser technology, and artificial intelligence software. The NAL staff strives to identify and evaluate these advanced technologies to determine their potential for improving the access and use of agricultural information. As new technologies are applied to specific projects, NAL works to transfer their use to other agricultural organizations, which could benefit from their adoption. Such technologies have great potential for making information more widely available in a more timely way and in greater depth than ever before. Overall, the use of advanced information technology, enables NAL to promote the organization and availability of agricultural information more effectively to the national and international agricultural communities.

To strengthen reference and information services to patrons in particular subject areas, NAL maintains specialized information centers. These information centers provide the capability for NAL to enhance services to current clientele, as well as to develop new service relationships with both public and private sector users. Through a range of outreach and networking activities, the information centers provide a focal point for agricultural topics of importance to the Department of Agriculture, the agricultural community throughout the Nation, and the public. In addition, information center staff concentrate their efforts on strengthening the NAL collection and developing information products. Information centers have a diverse audience including researchers, administrators, educators, consumers, and the private sector. Currently, NAL has information centers on Agricultural Trade and Marketing; Alternative Farming Systems (Low Input/Sustainable Agriculture); Animal Welfare; Aquaculture; Biotechnology; Food and Nutrition; Plant Genome; Rural Development; Technology Transfer; Youth Development; and Water Quality.

As a National Library, NAL serves a dual role as the primary literature source for both USDA and the American agricultural community, as well as the United States' authority among agricultural libraries and information centers internationally. Through cooperation with the National Library of Medicine, NAL also shares national collection responsibilities in the areas of veterinary science, human nutrition, and biotechnology.

National Agricultural Library

Justification of Increases and Decreases

- (1) A net increase of \$1,465,000 for library services, consisting of the following:

- (a) An increase of \$398,000 to cover inflation costs of collection development services.

Need for Change: - The cost of providing basic agricultural and scientific information services to NAL's USDA and nationwide patrons continues to rise. NAL's fundamental services to the user community require maintaining a current collection of books and journals and the capability to disseminate information to users through the document delivery services program.

Approximately 80 percent of NAL funds to acquire library materials is used to purchase subscriptions to agricultural and scientific journals. NAL users, including ARS scientists and researchers throughout USDA, rely on these journal publications. This is because journals typically contain the results of the most current scientific investigations. The 1993 U. S. Periodical Price Index study, sponsored by a committee of the American Library Association, indicates that the price of journals in science and technology continues to post higher rates of increase than other broad subject areas. Overall, agriculture, science and technology journals have experienced a 10 percent increase in the average annual subscription price since 1984. The cost of journal subscriptions in the social sciences (e.g., agricultural marketing, agricultural economics) has similarly posted an average increase of 9 percent over the same time period. Journals which cover highly specialized topics, such as biotechnology, have posted subscription price increases as high as 16.8 percent between 1990 and 1991 alone. A conservative projection, then, is that the cost of maintaining NAL journal subscriptions collection will rise by an average of 10 percent in FY 1995 over the FY 1994 prices.

Nature of Change: - In order to maintain the estimated FY 1994 purchasing power, the increase required to cover the rise in the price of journals and books is \$398,000.

- (b) An increase of \$281,000 to cover inflation costs of document delivery services.

Need for Change: User demand for NAL document delivery services continues to increase. NAL's document delivery service program, which includes maintaining the base service, a regional document delivery service for USDA clientele nationwide, and an active interlibrary loan component, also posts significant increases each year. These increases are associated with both the user demands and the labor intensive nature of these services.

In short, the continued success of the nation's agricultural research and investigations depends on NAL's ability to provide users with the latest scientific and agricultural information. This is accomplished by ensuring that the agricultural and scientific information maintained in NAL's collection, cited and indexed in the AGRICOLA database, and disseminated through the document delivery services program, is current and comprehensive.

Nature of Change: In order to maintain the document delivery services program at the FY 1994 service level, NAL will require an additional \$281,000. This new funding is essential to ensure the continuance of NAL's fundamental agricultural information services.

- (c) A decrease of \$251,000 for administrative efficiency.

Need for Change: In support of the Secretary's streamlining efforts and the President's Executive Order to reduce overhead-type outlays from the FY 1993 baseline, budget authority is reduced by \$251,000.

Nature of Change: In order to achieve these savings, NAL will reduce discretionary expenses by \$251,000 in FY 1995, in areas such as training and the purchase of supplies and materials.

- (d) A decrease of \$462,000 for the Leflar School of Law, University of Arkansas (\$462,000 available in FY 1994).

This decrease reflects the discontinuation of the funding of a grant to the Agricultural Law Library of the Leflar School at the University of Arkansas.

- (e) An increase of \$400,000 for National Storage and Preservation (-0-available in FY 1994).

Need for Change: - The preservation of agricultural and scientific information is central to NAL's mission as the USDA library and the principal agricultural information resource for the United States. The National Storage and Preservation Program would direct funding towards this aim by implementing a strategy to effect a transition to effective preservation of information in electronic formats.

The preservation component of this initiative is envisioned as a national cooperative effort, involving NAL, the United States Agricultural Information Network (USAIN), land-grant institutions, and other libraries, societies and archives with important agricultural collections. In a May 1993 report, the USAIN Advisory Panel on Preservation urged NAL to take a lead role in the implementation of a National Preservation Program for Agricultural Literature. The model for this cooperative preservation plan, developed by a team of experts in agricultural information, emphasizes the advancement of optical scanning technologies to preserve the nation's agricultural literature. This national coordinated effort contemplates NAL assuming the lead role in directing preservation efforts towards the transfer of agricultural literature into digital formats, rather than the conservation of the paper volumes.

The National Storage and Preservation Program is based in large measure on a recognition of the budget constraints involved. In this regard, this initiative proposes a practical approach towards preservation of the current NAL collection, while at the same time advancing cooperative strategies for preserving the nation's agricultural literature, and furthering the development of methods to convert existing materials into electronic formats.

Nature of Change: - Funds in the amount of \$400,000 will be used to utilize new technologies, such as miniaturization of actual page images of books and journals to preserve and store agricultural information on optical disks. Since it is now widely believed in the information science community that these discs will withstand deterioration for a minimum of 100 years, this technology provides the best potential for preserving the older deteriorated

agricultural and scientific volumes in the NAL collection. Initial efforts will be directed towards transferring valuable journals in the NAL collection into electronic formats before the paper is completely decomposed and unreadable. Thus, the proper "last use" of these fully deteriorated NAL volumes would be the process of transferring their contents into electronic formats.

- (f) An increase of \$1,000,000 for Electronic Information (-0- available in FY 1994.

Need for Change: - NAL has performed an intensive internal review and analysis of the issues associated with the Agency's ability to manage electronically created and stored information. Based on this review, NAL proposes implementation of this initiative in order to continue its national leadership role -- and its viability -- in the production, management and dissemination of agricultural information. The thrust of the initiative is to implement a program aimed at achieving an effective transition from providing information services using a traditional, print collection to achieving full capacity to provide electronic access to information via the Internet as part of the National Research and Education Network (NREN).

Core to all of the NAL programs has been the creation and advancement of the AGRICOLA database, which since 1970 has been the principal source of agricultural information for practitioners and researchers worldwide. With over 3 million records, AGRICOLA citations and indexing records correspond to the most important agricultural publications from around the world, and is used by the scientists and researchers of ARS, USDA, the land-grant universities and other institutions nationwide.

NAL's current paper-based information document delivery system which furnishes articles cited and indexed in AGRICOLA and other databases, is becoming increasingly inadequate to keep pace with the requirements and computer capabilities of the typical laboratory scientist or policy maker. The spate of information being produced in digital form, coupled with recent telecommunications innovations and the dominance of the Internet, have combined to vastly increase the resources available to agricultural researchers and scientists. Compared to the virtually instant electronic transmission of information via the Internet, the considerable time required to provide information through traditional methods -- involving publishing, procuring, physical handling and document delivery of paper products -- is rapidly rendering the traditional model obsolete. Thus, NAL's need to transition to this already emerging reality termed "library without walls" dictates an immediate shift from providing information services based on printed materials to methods in which NAL will facilitate users in obtaining information electronically.

Nature of Change: - Funding in the amount of \$1 million will be used to start-up NAL's Electronic Information Initiative. Funds will be directed to establishing NAL as the central node in an electronic system, providing agricultural information by directly linking users with the information producers.

As a national library, NAL is charged with the duty to manage information, promote standardized formats, repackage essential information for mass distribution, and electronically mediate access to information irrespective of where the data reside. In addition, NAL is an institution with a large user base capable of facilitating USDA research initiatives and enhancing the dissemination of these research results to the world.

These start-up funds will be used to begin to create the infrastructure necessary to ensure that NAL will have the capacity to function in this newly created environment, in which the instantaneous transmission of information worldwide is fast evolving as the standard. The necessary infrastructure includes the design and installation of an internal network fully compatible with the Internet. Library users will be provided with multiple use workstations with the capability to access and process data in a wide variety of electronic formats. Increased computer storage will be acquired to make USDA produced data as well as all agricultural data available electronically. A computer system within NAL will be developed to provide access to critical databases (i.e., AGRICOLA, genome databases, et al.) for use by ARS and USDA patrons, other Federal agencies, the land-grant institutions, farmers, ranchers, consumers and other members of the general public. Primary connectivity will be achieved via the Internet as part of NREN.

Funds will be used as follows:

Hardware/Software/Wiring.....	\$500,000
Training.....	25,000
Contract Modifications.....	25,000
Access, Licenses, Purchases.....	450,000
Total.....	1,000,000

(9) An increase of \$99,000 for Pay Costs.

NATIONAL AGRICULTURAL LIBRARY
GEOGRAPHIC BREAKDOWN OF OBLIGATIONS AND STAFF-YEARS
1993 And Estimated 1994 and 1995

	1994		1995		1996	
	<u>Amount</u>	<u>Staff Years</u>	<u>Amount</u>	<u>Staff Years</u>	<u>Amount</u>	<u>Staff Years</u>
District of Columbia..	\$226,432	5	\$303,916	5	\$325,000	5
Maryland.....	17,437,568	192	17,851,084	186	19,295,000	186
Subtotal, Available or Estimate.....	17,664,000	197	18,155,000	191	19,620,000	191
Unobligated Balance	51,000	---	---	---	---	---
Total, Available for Estimate.....	17,715,000	197	18,155,000	191	19,620,000	191

NATIONAL AGRICULTURAL LIBRARY

Status of Program

The National Agricultural Library (NAL) is one of the most heavily used and largest agricultural libraries and information services in the world, serving as the national resource for the collection and dissemination of information on all aspects of agriculture. NAL serves not only as USDA's departmental library, but also one of three national libraries of the United States (together with the Library of Congress and the National Library of Medicine), fulfilling national and international responsibilities for disseminating agricultural information. Furthermore, NAL coordinates and functions as the primary information resource for a national network of State land-grant university libraries working together to deliver agricultural information to all sectors of the population.

The basic services provided by the Library reflect the national and international nature of its mission. NAL lends books and provides photocopies of documents, responding to approximately 175,000 such requests annually. During FY 1993, AGRICOLA (AGRICultural OnLine Access), NAL's master bibliographic database, increased to more than 3 million computerized citations of books and articles on worldwide agriculture. AGRICOLA is available on magnetic tapes sold through the U.S. Department of Commerce's National Technical Information Service, and can also be accessed nationally and internationally through commercial vendors. The NAL collection, on which AGRICOLA is based, contains books, journals, maps, audiovisuals, and microcomputer software obtained through purchase, gift, and exchange arrangements. Collection development activities, including the acquisition of agricultural and scientific materials in more than 30 languages from 150 countries, represent a major activity of NAL in carrying out its mission.

NAL's general reference units and subject-oriented information centers provide comprehensive reference and referral information services to support USDA policy makers, research and administrative scientists, and other USDA personnel. Reference services are also extended to other Federal and State agencies, Congressional staff, and industry as well as to the general public after local and regional resources have been exhausted.

NAL's 11 specialized information centers continue to meet the growing demand for information on a wide range of topics of vital interest to USDA and the national and international agricultural community. The subject areas covered by these information centers include: agricultural trade and marketing; alternative farming systems (sustainable agriculture); animal welfare; aquaculture; biotechnology; food and nutrition; plant genome; rural development; technology transfer; water quality; and youth development.

Current Activities

Networking. NAL conducts a national education and training program designed to inform actual and potential users about NAL operations, resources, and services. NAL offers workshops and demonstrations in cooperation with agricultural institutions, and professional and trade organizations across the country. The emphasis in this program is on the use of online bibliographic files and other computer services. Additional services such as briefings, tours, and exhibits are provided for domestic and foreign visitors to NAL.

NAL works closely with library directors at 1890 land-grant and 1862 land-grant universities to enhance access to agricultural information in these universities. Through its role in the Department's initiative to establish centers of excellence in these universities, NAL is working to ensure the development of library collections and services that will support the mission of each center.

In response to the increasing demand for technical information on agriculture, NAL continues to expand its collection development and information access programs through coordination of holdings with and among land-grant universities and through international exchange programs with foreign governments, universities, and research centers. The Library initiates and implements cooperative indexing and cataloging projects with public and private institutions and strengthens agricultural library and information activities nationally through the development and adoption of standardized formats and processing procedures essential for national networking. Ongoing cooperative collection development activities include coordinating the development of comprehensive plans and policies for the acquisition of agricultural literature. Some of this coordination is achieved through negotiated agreements between NAL and the National Library of Medicine, designed to ensure complete coverage while avoiding unnecessary duplication of resources in the fields of veterinary science, nutrition, biotechnology and animal welfare.

New cooperative initiatives underway focus on utilizing and applying state-of-the-art information technology, including the development and enhancement of ISIS, NAL's integrated library system. Innovative approaches to expanding the benefits of improved information services to other USDA information providers are being explored. One such project is aimed at providing online dial-up access to the system at NAL for the Agricultural Research Service (ARS) regional libraries and other research sites. A related effort will permit ARS libraries to include records of their holdings in ISIS. In a related effort, NAL and the USDA Extension Service have issued a CD-ROM containing over 50,000 pages of agricultural information to assist state extension workers. An example of a cooperative pilot project between NAL and the USDA Economic Research Service (ERS) produced a CD-ROM simulation product containing ERS publications.

Information Centers.

Identifying potential and existing audiences, developing products and services to meet their information needs, and providing frequent communication utilizing optimal information technology are the objectives of each information center. Emphasis is placed on outreach and liaison activities with all the various clientele groups interested in that particular subject area. Collaborative efforts with other Federal agencies both within and outside USDA have allowed NAL to greatly expand existing networks to include rural health practitioners, rural elected public officials, school food service managers, nutritionists in the Women, Infants, and Children Supplementary Feeding Program, and educators.

NAL's Information Centers also provide new forums for international networking and information exchange. The databases being developed by the Plant Genome Data and Information Center will be international in scope. Efforts are underway to develop links with similar database efforts in Japan. The Aquaculture Information Center serves as the central information exchange point for Federal agencies and research institutions in Japan and the People's Republic of China.

State Agricultural Publications. NAL and land-grant libraries work cooperatively to provide improved coverage of state agricultural publications. Through their combined efforts, the national and state libraries can collect, process, and provide document delivery services for state cooperative extension service and experiment station publications. The goal of this program is to identify resources for agricultural information as well as to ensure the preservation of these materials for archival purposes. NAL maintains contact with each of the responsible institutions in order to develop a comprehensive collection of these state publications which are cataloged and indexed in AGRICOLA. NAL, Kansas State University (KSU) Library, and the Kansas Cooperative Extension Service, plan a demonstration project to expand the scope of this ongoing program and possibly serve as a model for similar projects with other states. The KSU

Library will train extension service staff in cataloging so they may provide so-called "minimal level" catalog records for their publications as they are produced. These records will be enhanced by KSU's Library to include NAL-required additions. The records will then be input into the local library system as well as into AGRICOLA, OCLC (an international bibliographic utility) and ISIS, NAL's local online catalog. Access to these publications will thereby be enhanced and the cooperative extension service staff will have a current, accurate database of the publications which they and the experiment stations produce.

International Networking. NAL engages in a wide range of international activities relating to the worldwide collection and dissemination of information on agriculture and related subjects. NAL's AGRICOLA database is accessible online worldwide, and on CD-ROM from commercial vendors. NAL is the designated U.S. center for AGRIS, the international agricultural information system of the United Nations Food and Agricultural Organization (FAO), and which also provides essential support to the FAO's Aquatic Science and Fisheries Information System. Under an arrangement with the CAB International, NAL is augmenting and updating the CAB Thesaurus, an agricultural vocabulary. A related project to provide more comprehensive access to international agricultural information through an enhanced thesaurus system is being coordinated by NAL in conjunction with CAB International and FAO. It is NAL's policy to promote the indexing of agricultural literature by the originating country, in order to conserve resources by enabling NAL to focus on the indexing of U.S. literature. Jointly with CAB International, NAL produced an International Union List of Agricultural Serials, published in 1990. The CD-ROM version of the World List of Agricultural Serials, from which the International Union List was extracted, was made available in 1992 by SilverPlatter International. This database contains citations to more than 56,000 retrospective and current serial titles with annotations indicating whether the title is indexed in any of the three major agricultural databases: AGRICOLA, CAB Abstracts, and AGRIS. Steps are now being taken to determine the feasibility of creating a union list for key agricultural libraries worldwide based on this database.

Following the intense political and economic evolution in the nations of central and eastern Europe, NAL hosted the first in a series of U.S./Central European Agricultural Library Roundtable meetings to explore the potential for cooperation in the exchange of agricultural information. As a result, NAL and its counterparts in the region have entered into a joint program of cooperation to enhance access to agricultural information by strengthening existing avenues and expanding the use of technologies. With NAL's encouragement, including greater personal and institutional contacts, the exchange of agricultural information with both the People's Republic of China and the Newly Independent States has expanded significantly.

A major function of the bibliographic program is to organize library materials for use by researchers, and to announce newly-published research to the agricultural community. This includes cataloging books and journals acquired for the collection, and indexing journal articles, conference proceedings, and reports selected for their importance to agricultural research and education. The Library's resources are made available in a number of ways, including the interlibrary loan of books and photocopies of journal articles. Requests for documents from USDA field employees are handled locally in 36 States and Puerto Rico in cooperation with land-grant university libraries whenever possible, with the NAL serving as a backup source for document delivery services.

NAL must ensure that scientists, administrators, educators and other users continue to have access to all useful information in the collection, including that contained in deteriorating materials. To accomplish this, a preservation program is required. This includes the transference of information to other

formats, binding unbound materials, restoring important documents and making in-house minor repairs when technically feasible. The staff has completed a report of a comprehensive preservation planning program study investigating all aspects of preservation activity at NAL from physical and environmental conditions of the collection to disaster control, staff and user education, and inter-institutional cooperation. The ultimate purpose of the study is to develop and implement an effective program for ensuring the availability of important agricultural information for future generations of researchers and other users.

Information Systems Technology. The first phase of the National Agricultural Text Digitizing Project, a cooperative undertaking by NAL and 44 land-grant university libraries to evaluate new methods of capturing and disseminating full text information on CD-ROMs, has been completed. The project has become a fully operational program to continue digitizing, disseminating, and preserving agricultural materials, and has published several CD-ROMs, including: "Agronomy Journal, Vol. 1-16", in cooperation with the American Society of Agronomy; "Aquaculture 11"; "George Washington Carver," containing papers, notes and letters scanned from microfilm; and "Food Irradiation I." Production of a second agronomy CD-ROM, covering the Agronomy Journal, Vol. 17-22 is underway. Using a system which digitizes both the page image and the text on the page, users are able to search the text of documents by any word or combinations of words.

The National Science Foundation's NSFNET telecommunications network is serving as the backbone for a project which enables NAL to deliver documents to other libraries through the high speed electronic transmission of page images. NAL also utilizes advanced information technology to expand its capabilities and improve its responsiveness. NAL has moved to the leading edge of new technology in information science by pioneering projects on compact disks, interactive video disks, full text digitization, optical scanning technology, electronic telecommunications of library materials, expert systems, and video disk for storage of photographs. As a result of these efforts, services to users has been improved through faster response and more complete coverage of subject areas.

Incorporation of electronic resources, including the use of the Internet, is transforming the basic functions and services of the library. For example, electronic technologies are now used to acquire and process new library materials, reference questions can be asked and answered electronic via the Internet and by modem, and the resources of the library are increasingly being made available to end users directly in electronic form.

Levels of Activity. Other primary activities for Fiscal Years 1993, 1994, and 1995 are as follows:

Estimated Productivity

Estimate	Actual		Estimate
<u>Types of Activities</u>	<u>FY 1993</u>		<u>FY 1994</u>
<u>FY 1995</u>			
Serial Issues Added	133,176	135,000	136,000
Number of Titles Cataloged	19,375	20,000	20,250
Articles Indexed	87,756	80,000	80,000
Pages Preserved		3,300,000	3,300,000
3,300,000			
Document Requests Filled	131,948	130,931	130,186
Reference Inquiries Answered	52,655	53,500	54,000
Automated Searches Conducted	34,120	34,000	33,500
Current Awareness Literature Searches	92,176	96,785	101,624
Current Awareness Literature Profiles			
by all databases	21,396	22,465	23,588

Selected Examples of Recent Progress

Reference Requests over Internet. Effective May 1, 1993, NAL's Reference Section, which provides reference and information assistance nationally and internationally, began accepting requests for reference services over the Internet. Services are provided to Federal, state and local government scientists, researchers and officials; professors, researchers and students at universities and colleges; private scientific, business and agricultural organizations; the general public and foreign government agencies. The Internet address for NAL Reference to reach NAL is: "agref@nalusda.gov."

Plant Genome Database Now Available. In support of the USDA Plant Genome Project and the Agricultural Research Service, NAL is making available the USDA Plant Genome Database and related data in several formats over the Internet and via modem access. The database contains genomic information (data on maps, probes, germplasm, and genes) on several crop species including maize, soybean, and wheat. The principal user groups, plant breeders and geneticists, will be able to approach the databases in a variety of ways. This strategy enables users with varying levels of automation skills and needs to make the most use of the data. In further support of this program, NAL has increased indexing coverage of plant genetics literature in AGRICOLA.

Electronic Bulletin Board Available Through Internet. The Agricultural Library Forum (ALF), NAL's electronic bulletin board system, offers public access via computer-telecommunications links to a vast array of agricultural information products, services, and assistance. Research assistance on all aspects of agriculture -- including trade and marketing, aquaculture, forestry and biotechnology -- has been provided by ALF since its inception in 1988. ALF has provided information and resources from NAL and other sources in response to 50,000 calls. In a new development, Internet users may now be linked to ALF through the FedWorld bulletin board system of the U.S. Department of Commerce, NTIS. All of ALF's files, conferences and messages are now accessible via the FedWorld. When the planned direct linkage of ALF to the Internet is completed, file transfers will be accomplished at network speed, giving users nearly instantaneous access to these files.

Multimedia CD-ROM on Ornamental Horticulture. NAL, along with the University of Florida Institute for Food and Agricultural Sciences and the Michigan State University Cooperative Extension Service, developed an interactive multimedia CD-ROM on home landscaping entitled "Plant It!-CD." The disc contains information on do-it-yourself landscaping, including 24 landscaping designs and information on nearly 1,000 plants that grow best in the various climate zones of the United States.

Food Irradiation Evaluation Study. NAL received funding from the USDA Science and Education evaluation funds and the USDA Food Safety and Inspection Service, to begin an evaluation study on providing international access to food irradiation materials. NAL will convert an NAL-produced food irradiation CD-ROM to another software package improving its usability and will employ a food irradiation expert to select documents for future electronic storage. Germany and France are interested in providing documents and databases to NAL so that NAL will become the international center for food irradiation information.

Computer Assisted Indexer Training at NAL. NAL's Indexing Branch has embarked upon a project to develop a computer-assisted training program to replace its present instructional method. New indexers generally spend 6 months to 1 year under the tutelage of an experienced indexer. Some of the expected benefits of this program are 1) reduced time required for novice indexers to achieve journeyman level; 2) increased productivity; 3) increased consistency and quality of the AGRICOLA database; and 4) potential use by the agricultural information community.

NAL Implements Electronic Ordering of Scientific Literature. Beginning in October 1993, the Acquisitions and Serials Branch began electronic transmission of monographic orders to one of its vendors, Blackwell North America, Inc. NAL is the first library to successfully use electronic ordering between the VTLS Acquisitions and Fund Accounting System (AFAS) and this vendor. Electronic transmission of orders means that the vendor will receive NAL's book requests in a matter of minutes, rather than days. Orders will be processed sooner by the vendor, resulting in faster receipt of scientific literature at NAL. NAL is currently working toward implementing electronic ordering for as many of the library's vendors as possible.

Letter of Understanding with the Egyptian National Agricultural Library. NAL is assisting Egyptian Ministry of Agriculture in the establishment of an Egyptian National Agricultural Library (ENAL). A Letter of Understanding between the two libraries was signed in May 1993.

A number of planning and consulting meetings have been held culminating in a training plan through which over 92 ENAL staff will be trained at NAL. This training will include acquisitions processing, cataloging, public services and new technologies. NAL staff will also assist in the installation and implementation of an integrated library system at the new library building in Cairo prior to the library opening in summer 1994.

NAL Increases Cooperative Cataloging Efforts. In mid-1993, NAL began participation in the National Coordinated Cataloging Program (NCCP). NCCP is a cooperative cataloging program of the Library of Congress (LC) in which selected libraries produce full level cataloging record for inclusion in the LC database and bibliographic utility. These cooperative efforts enable the database to be more current, provide access to more records, and reduce duplication of effort among the National Libraries.

Improvements in Interlibrary Borrowing. Several changes have enhanced service to USDA clientele needing items that NAL cannot supply from its collection. Through the use of ARIEL software, articles scanned by the provider are sent to NAL or directly to the patron via the Internet. Turnaround time has been reduced from days to hours, and postage costs have been eliminated. Additionally, by increasing its use of commercial document suppliers, NAL can obtain articles via telefacsimile usually within 24 hours, and sometimes in as little as six hours. Additional providers of this level of service will be added during FY 1994.

NAL Improves Regional Document Delivery System (RDDS) Network. NAL initiated an aggressive planning and communications program to improve NAL the RDDS service, which enables USDA employees in 36 states and Puerto Rico to request and receive documents directly from 37 land-grant university libraries, with NAL serving as the backup library. As a result, new guidelines were developed and implemented nationwide, laying out the network guiding principles designed to improve the level of service to participants, and outline the responsibilities of both NAL and land-grant participants. To further enhance rapid communication among RDDS institutions, NAL and Cornell University have cooperatively established an Internet discussion group.

Food Labeling Education Database Available. A database of food labeling education activities throughout the United States is now available at the Food Labeling Education Information Center of NAL. The database was set up to assist those working to develop education programs on new food labeling laws. It includes projects, research and educational materials (brochures, videotapes, etc.) that have been produced to inform the public about new food labeling laws that recently took affect. The Food Labeling Education Information Center, part of NAL's Food and Nutrition Information Center, is a cooperative effort among NAL, the Food Safety Inspection Service of the USDA and the U.S. Food and Drug Administration.

Electronic Information Products Available from the Animal Welfare Information Center (AWIC). AWIC is maintaining an electronic library of full-text animal welfare information including legislation and regulations. The library is updated periodically and is distributed on diskette.

Library Works to Provide Youth Development Information. NAL's Youth Development Information Center (YDIC) continues cooperative efforts with the USDA Extension Service and the 4-H Program, to identify and make available, in digital format, information on youth development for extension agents. The YDIC is also working with the National Collaboration for Youth and the National Society for Fund Raising Executives on projects aimed at improving computer networking for the youth development and resource development communities. It is anticipated that these initiatives will allow for more youth development information to be made available and will improve the quality of that information.

Central Europe Agricultural Business Guide Prepared. NAL's Agricultural Trade and Marketing Information Center has prepared a publication to assist U.S. agribusinesses interested in exporting to or doing other business with Central European countries. For each of eight countries, the publication "Eastern Europe: Going Global" lists selected readings on business climates, addresses to contact for information and briefing notes on each country. Countries covered are Albania, Bulgaria, the former Czechoslovakia, Hungary, Poland, Romania, the former Soviet Union, and Yugoslavia.

Public Interest Group Electronic Partnership. NAL's Rural Information Center (RIC) is loading the monthly newsletter, Economic Development Digest, on NAL's electronic bulletin board system, at the request of the National Association of Development Organizations Research Foundation. The Foundation began publishing the newsletter in 1992 as "a monthly report for the economic development community." The newsletter is prepared under a cooperative agreement with the U.S. Department of Commerce's Economic Development Administration, with additional funding from the USDA Forest Service.

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